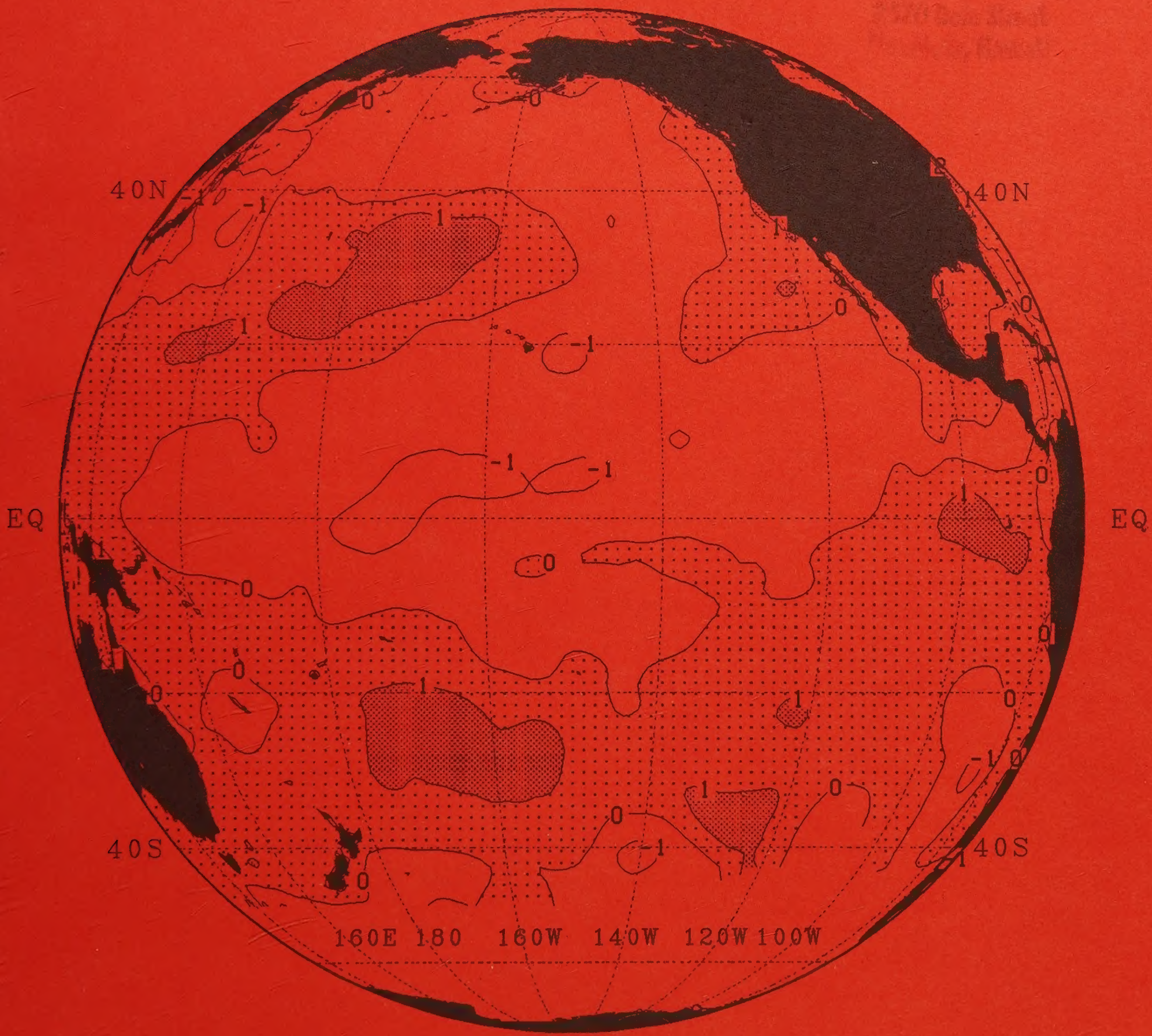
気　象　庁　海　洋　月　報

Monthly Ocean Report

April 2000 (No. 88)



Climate and Marine Department
Japan Meteorological Agency

気象庁　気候・海洋気象部

平成１２年４月

気象庁海洋月報は、気象庁 気候・海洋気象部 海洋課で作成しています。

本月報に関する問い合わせは、

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Monthly Ocean Report is prepared by the Oceanographical Division, Climate and Marine Department, Japan Meteorological Agency.

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表紙は、2000年4月の太平洋の月平均海面水温偏差図です。
陰影部は、平年より高温の海域を示しています。

The figure on the front cover shows the monthly mean SST anomalies for April 2000 in the Pacific Ocean.
Areas of positive anomalies are shaded.

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海況の特徴（２０００年４月）

日本近海の海況

海面水温は、釧路沖の正偏差を除き日本周辺のほぼ全域で負偏差となり、千島列島近海と三陸沖から本州南方、九州西方から東シナ海北部及び日本海中部で平年より1℃以上低かった（第４図）。

黒潮は、上旬は四国から紀伊半島にかけて接岸した後南東に流れ、32°N、139°E付近で北に向きを変え、更に八丈島付近で東北東に向きを変えて流れていた。中・下旬は潮岬沖でやや離岸して東南東に流れ、中旬は32°N、139°E付近から北に向きを変え、下旬は137°E付近と140°E付近で南に小さく蛇行した後、140.5°E付近で北に向きを変えて房総沖を東北東に流れていた（第９図）。

親潮系の冷水の沿岸寄りの分枝は37.5°N、142.5°Eまで、沖合の分枝は39.0°N、146.0°Eまで達していた（第5図）。

太平洋の海況

太平洋赤道域の海面水温は、155°Eから130°Wにかけて平年より0.5℃以上低かった。一方、145°E以西と110°Wから85°Wにかけては平年より0.5℃以上高かった。

北太平洋では、20°N、170°Eから40°N、160°Wにかけて平年より1℃以上高かった。一方、その北東側の45°N、170°Wから30°N、135°Wにかけては-0.5℃を超える負偏差となっていた。南太平洋では、30°Sに沿って175°Wから150°Wにかけて+1℃を超える正偏差となっていた（第16図）。

Highlights April 2000

Seas adjacent to Japan

SSTs were genarally below normal in the seas around Japan except the seas off Kushiro. Negative SST anomalies exceeding -1°C prevailed around the Kuril Islands, off Sanriku to south of Honshu, west of Kyushu to the northern part of the East China Sea and the central Japan Sea (Fig. 4).

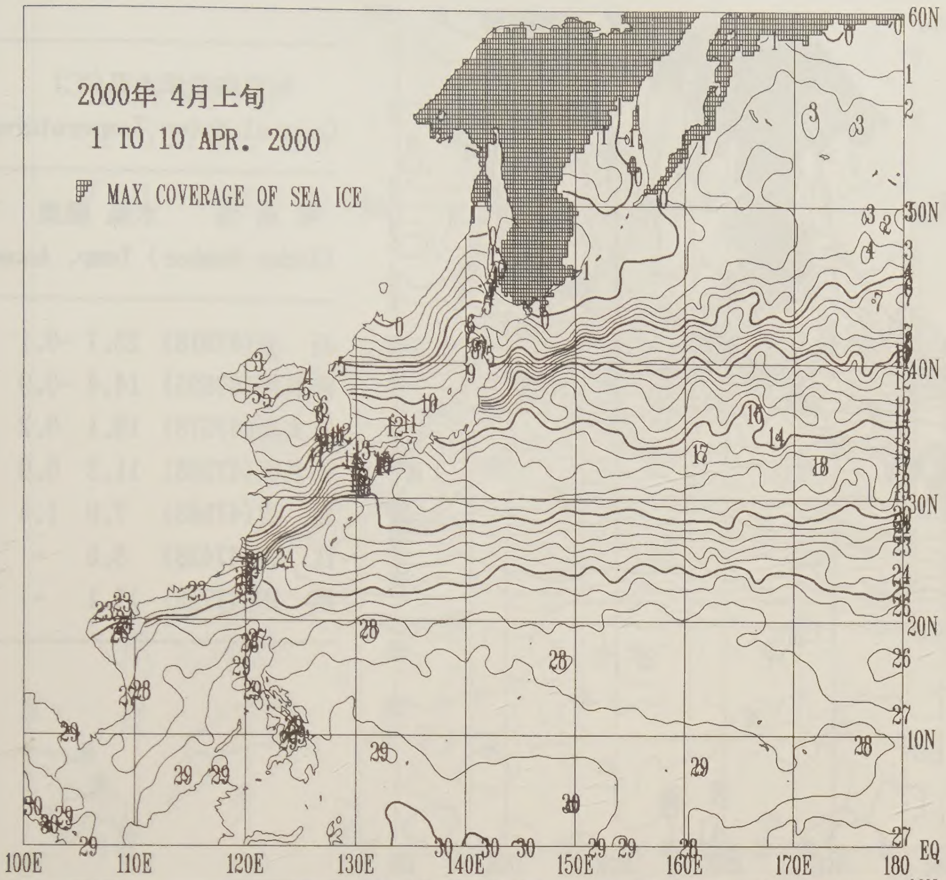
In the west of the Kii Peninsula, the Kuroshio flowed along the coasts through the month. In the first 10-day, it flowed SE-ward from the Kii Peninsula, turned northward at 32°N, 139°E and turned ENE-ward near Hachijo Island. In the second 10-day, the Kuroshio flowed ESE-ward off the Shiono-Misaki, turned northward at 32°N, 139°E, and flowed ENE-ward off the Boso Peninsula. In the last 10-day small meanders were found near 137°E and 140°E (Fig. 9).

Coastal and off-coastal branches of the Oyashio cold water extended southward to 37.5°N, 142.5°E and 39.0°N, 146.0°E, respectively (Fig. 5).

Pacific Ocean

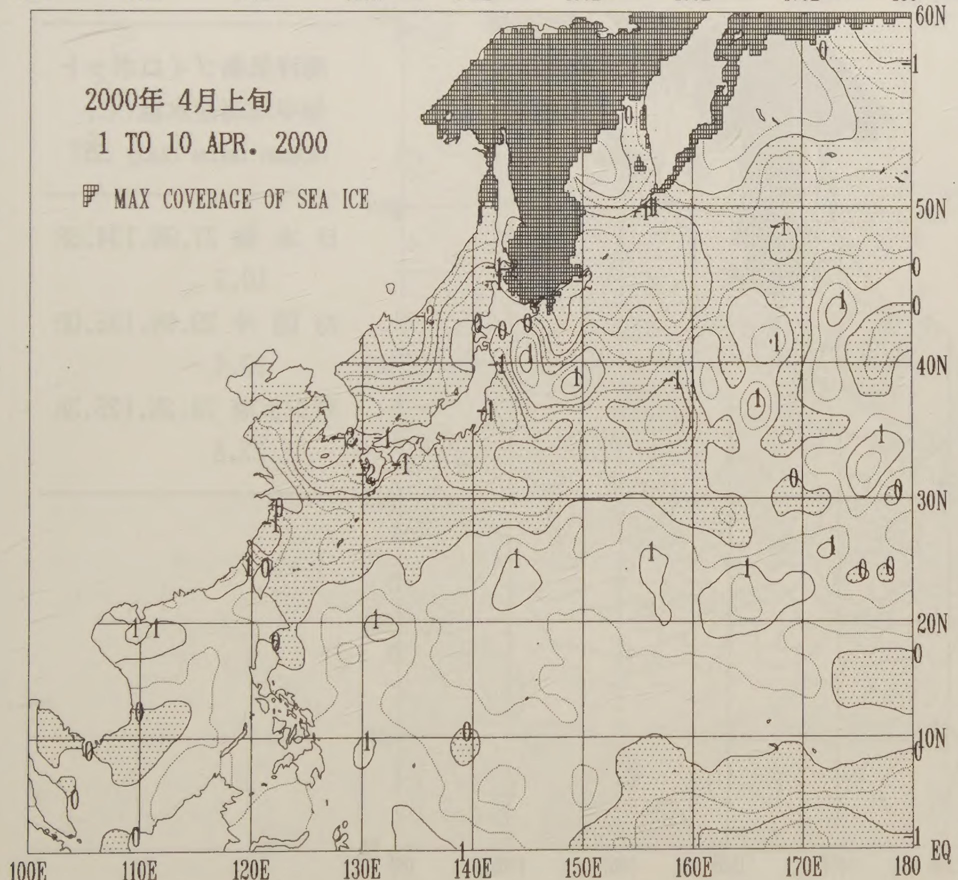
In the equatorial Pacific, negative SST anomalies exceeding -0.5°C prevailed from 155°E to 130°W. SSTs were more than 0.5°C above normal west of 145°E and from 110°W to 85°W.

In the North Pacific, positive SST anomalies exceeding +1°C prevailed from 20°N, 170°E to 40°N, 160°W. Negative SST anomalies exceeding -0.5°C were found from 45°N, 170°W to 30°N, 135°W. In the South Pacific, positive SST anomalies exceeding +1°C prevailed along 30°S from 175°W to 150°W (Fig. 16).



旬平均沿岸水温(℃)
Coastal Water Temperature

地 点 名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	23.2	0.1
御前崎(47655)	13.4	-0.8
八丈島(47678)	18.5	0.4
小名浜(47598)	9.6	0.1
宮　古(47585)	7.3	1.2
江　差(47428)	8.0	-
浜　田(47755)	13.7	-



海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日 本 海 37.9N,134.5E
10.2
四 国 沖 29.0N,135.0E
19.3
東シナ海 28.2N,126.3E
20.3

第1図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(2000年 4月上旬)

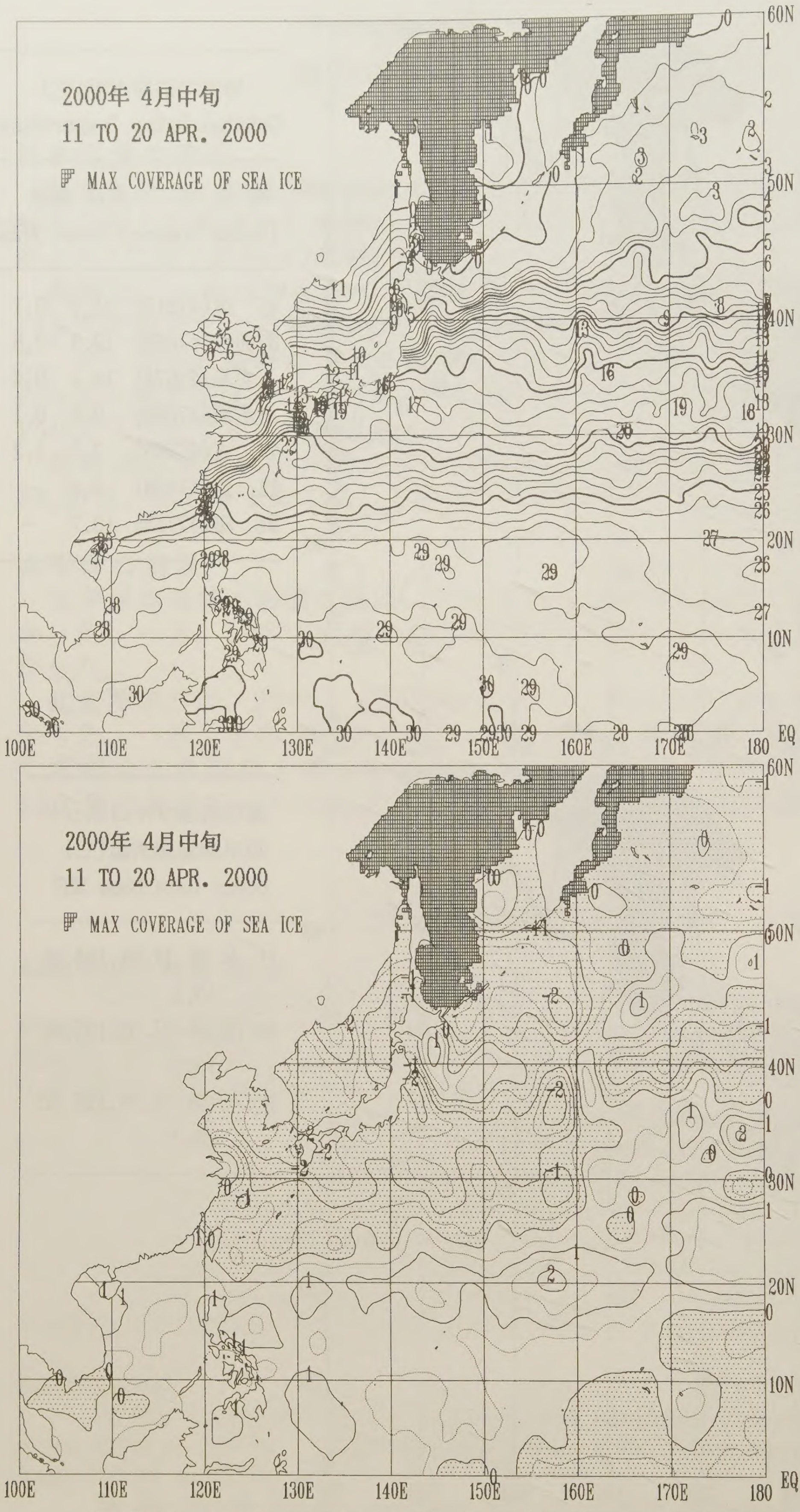
Fig.1 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 1st ten-day period in APR 2000. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

旬平均沿岸水温(℃)
Coastal Water Temperature

地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	23.7	-0.1
御前崎(47655)	14.4	-0.9
八丈島(47678)	19.1	0.2
小名浜(47598)	11.3	0.9
宮　古(47585)	7.9	1.4
江　差(47428)	8.5	-
浜　田(47755)	14.1	-

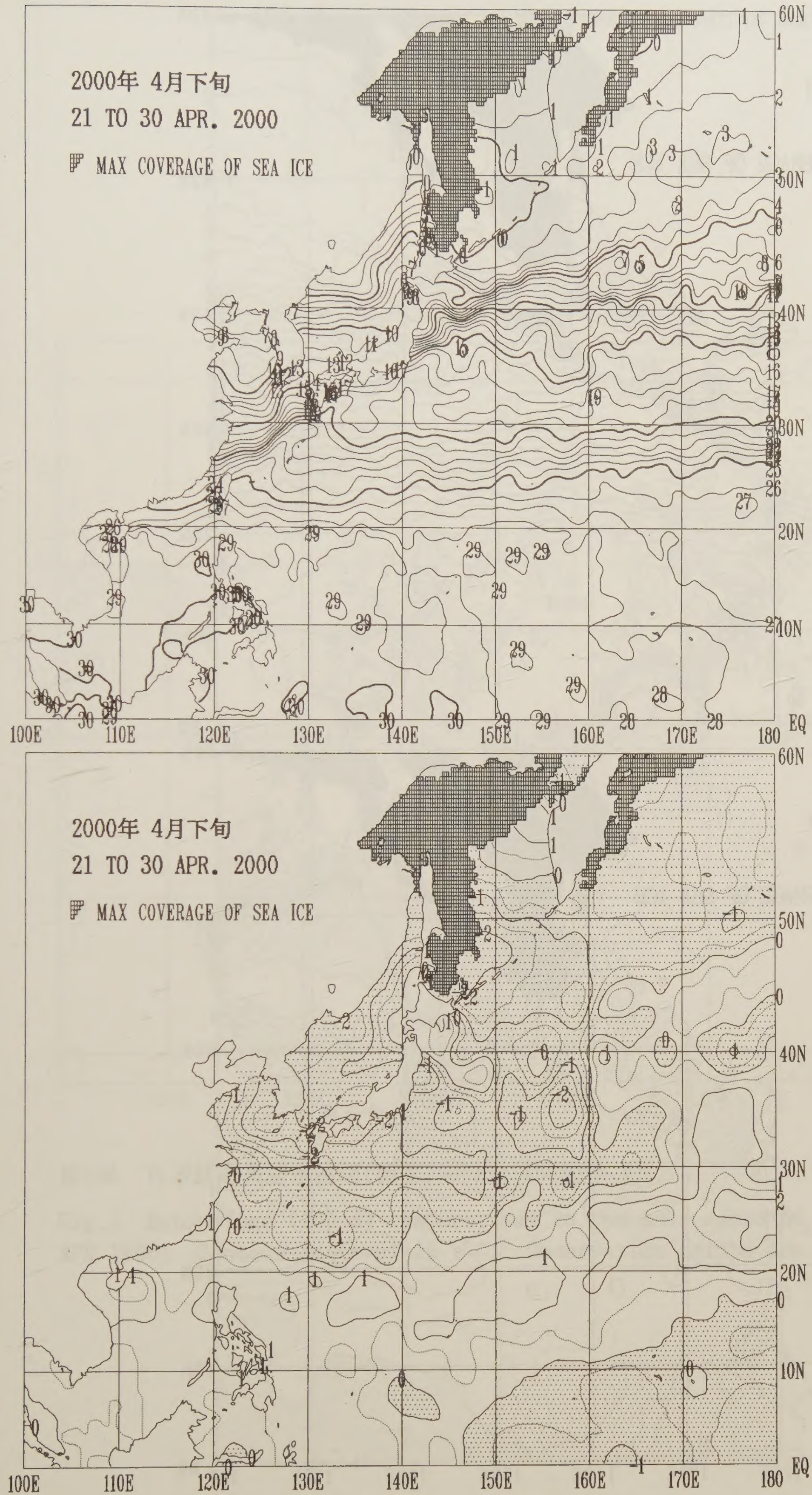
海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,134.5E	10.5
四国沖	29.0N,135.0E	19.4
東シナ海	28.2N,126.3E	22.8



第2図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(2000年 4月中旬)

Fig.2 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 2nd ten-day period in APR 2000. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)
Coastal Water Temperature

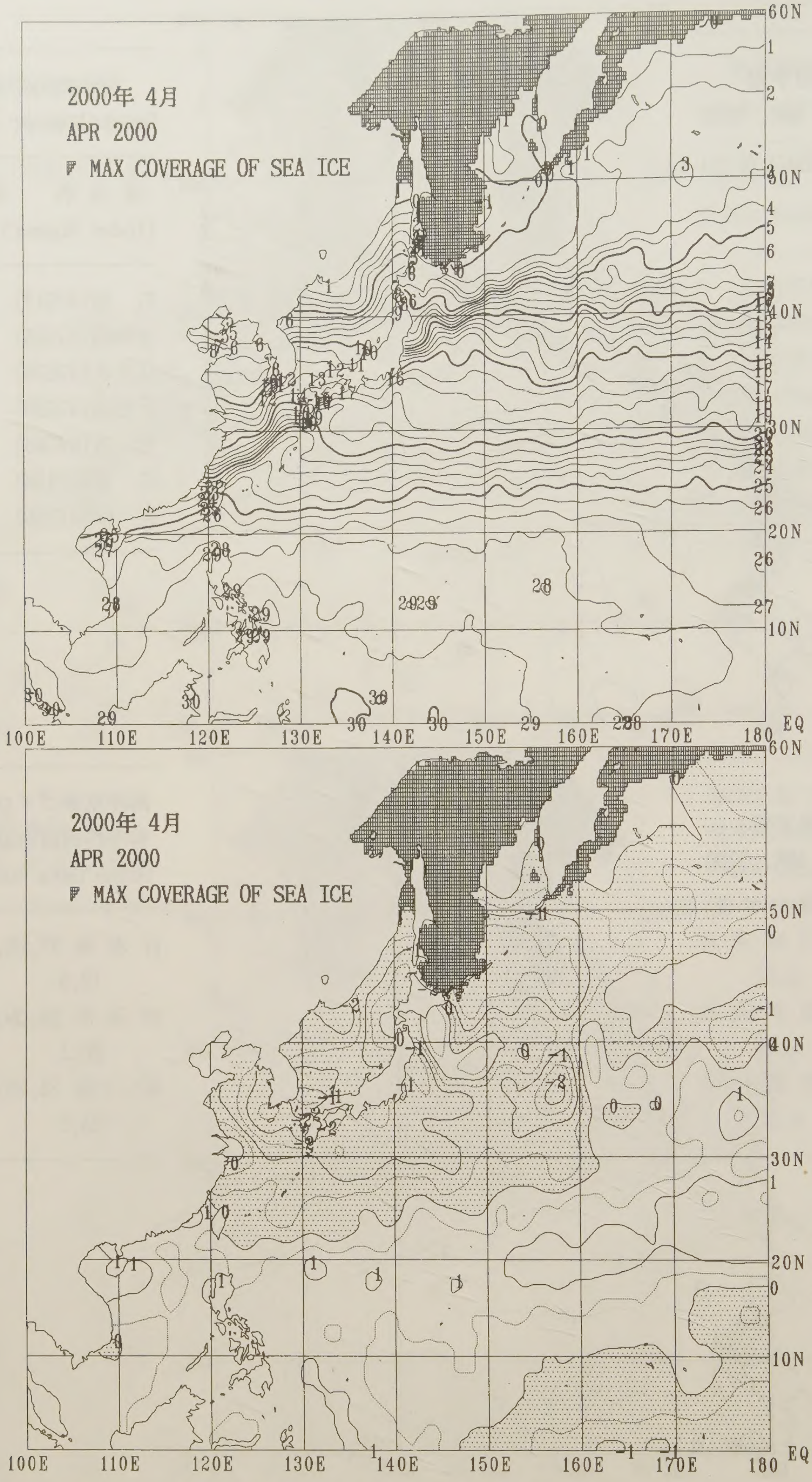
地 点 名 (Index Number)	水温 Temp.	偏差 Anom.
石 垣(47918)	24.0	-0.7
御前崎(47655)	15.1	-1.3
八丈島(47678)	17.9	-1.3
小名浜(47598)	11.6	0.7
宮 古(47585)	8.3	1.2
江 差(47428)	9.2	-
浜 田(47755)	14.7	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日 本 海	37.9N,134.5E	12.8
四 国 沖	29.0N,135.0E	20.1
東シナ海	28.2N,126.3E	23.6

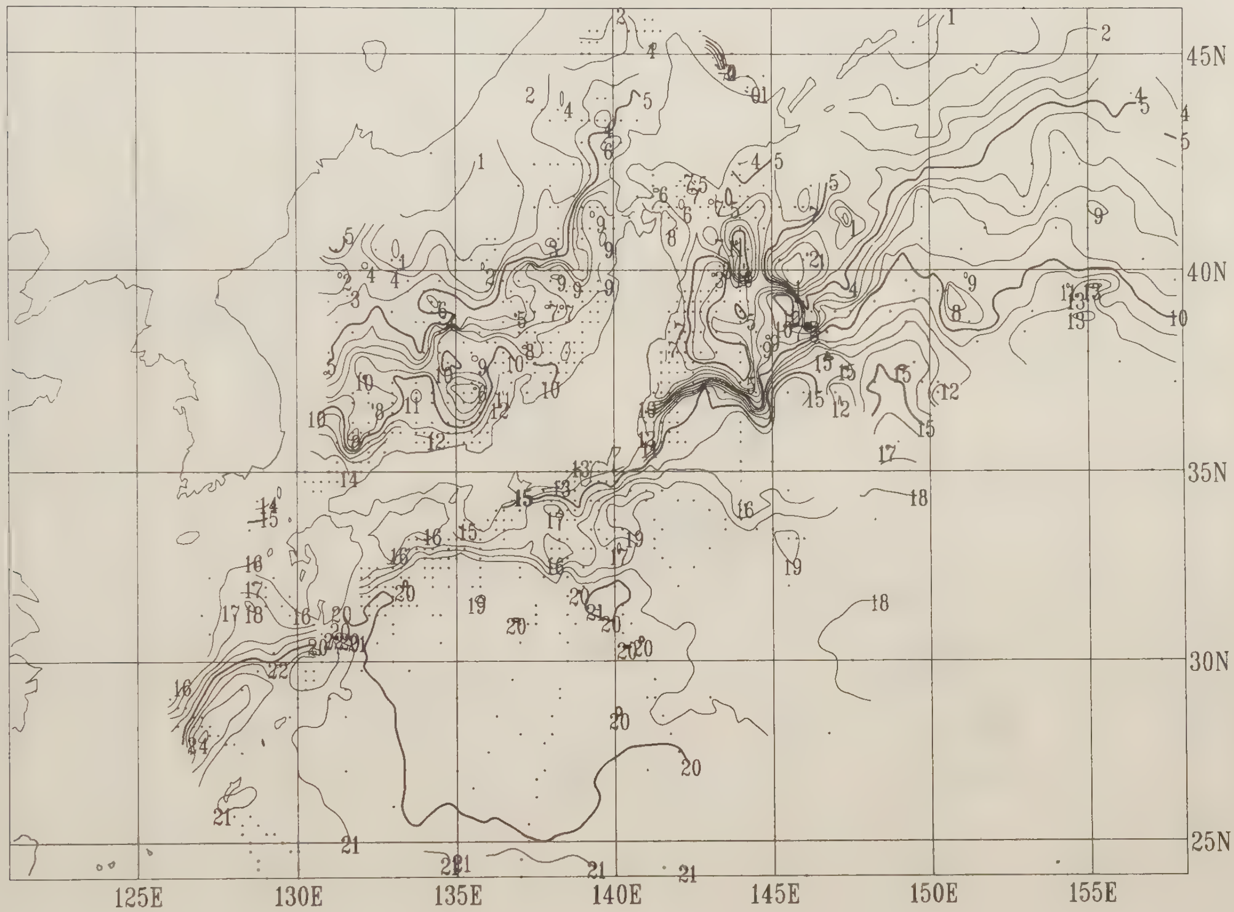
第3図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(2000年 4月下旬)

Fig.3 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 3rd ten-day period in APR 2000. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



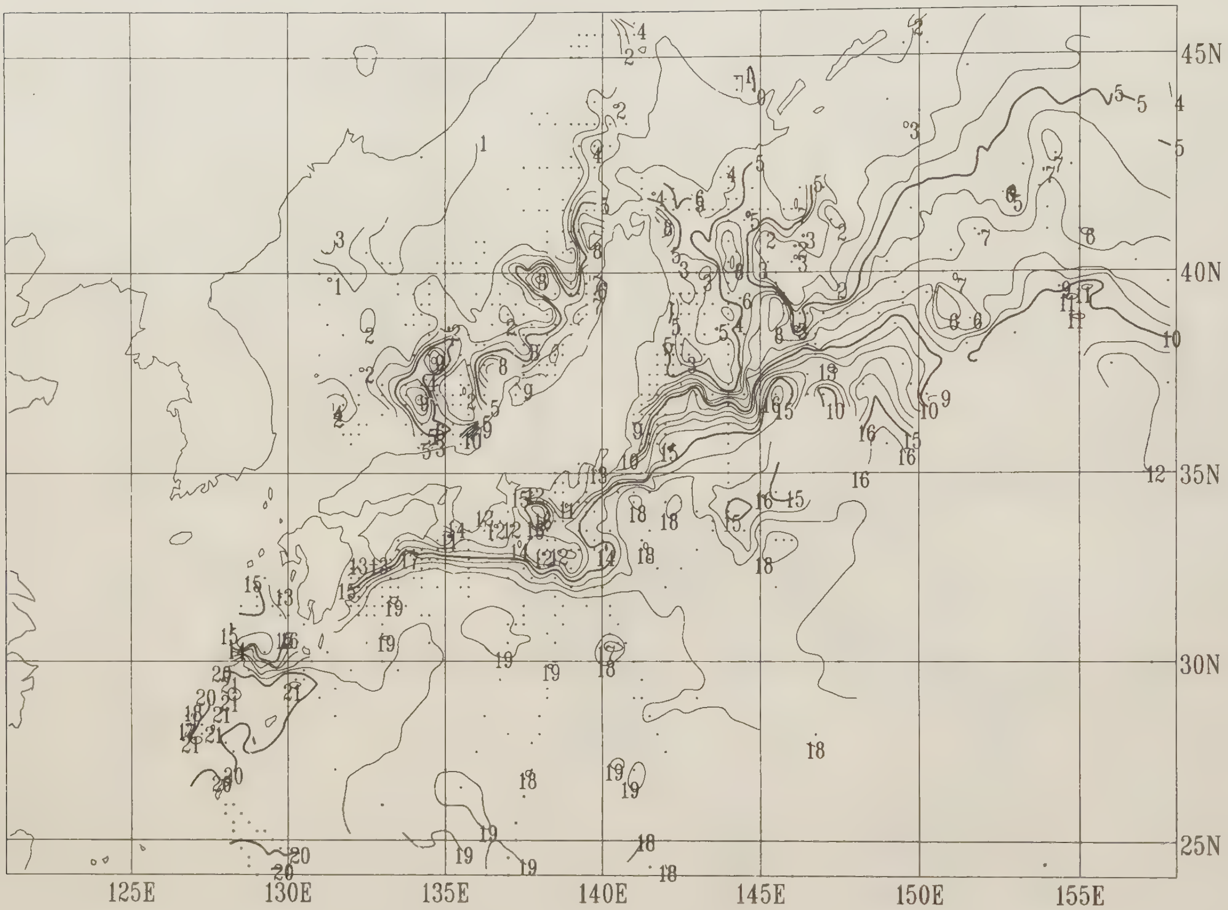
第4図 北西太平洋月平均海面水温図(上)及び偏差図(下)(2000年 4月)

Fig.4 Monthly mean SST (top) and anomalies (bottom) in the western North Pacific for APR 2000. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



第5図　日本近海表層水温図(深さ100 m) (2000年 4月)

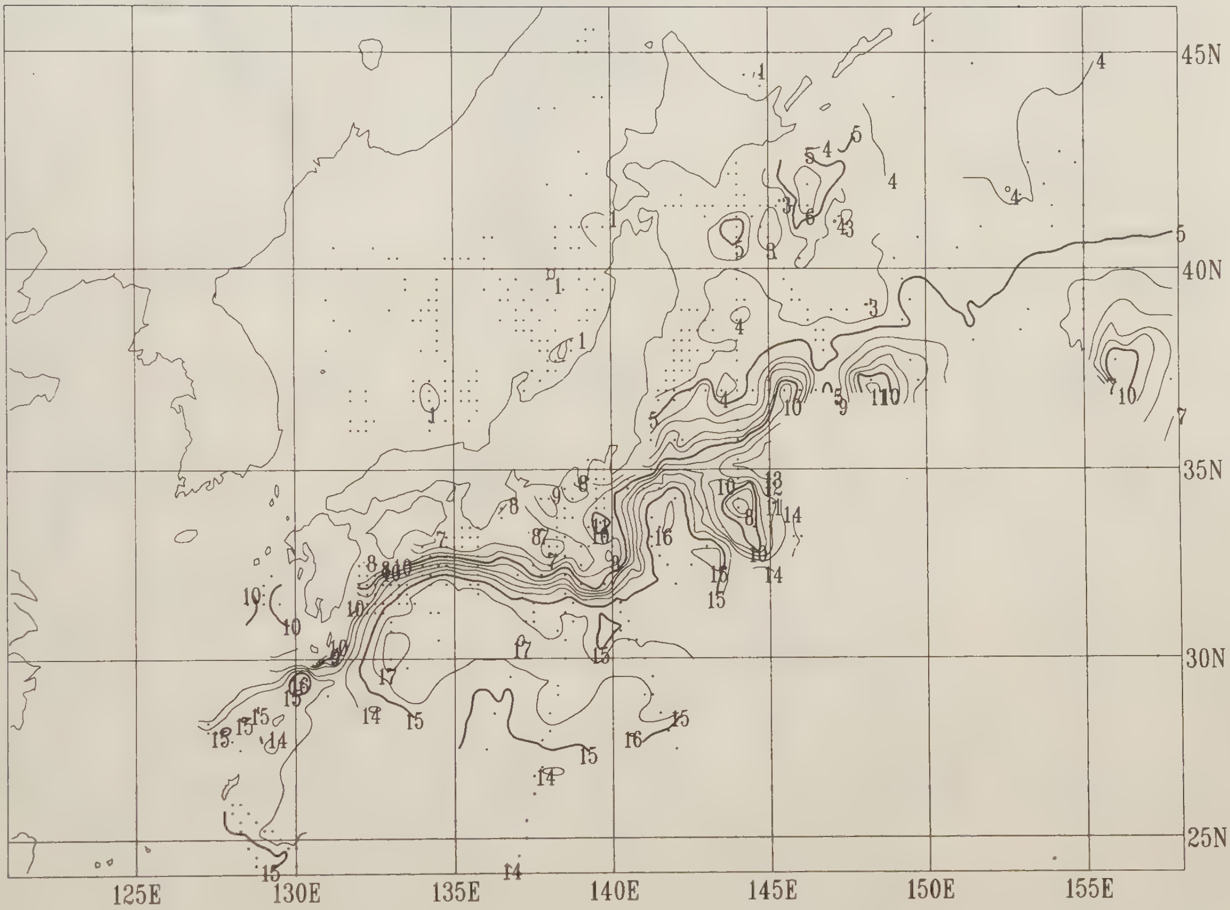
Fig.5 Subsurface (100 m) temperatures in the seas adjacent to Japan for APR 2000. Contour interval is 1°C. Observation points are denoted by dots.



第6図　日本近海表層水温図(深さ200 m) (2000年 4月)

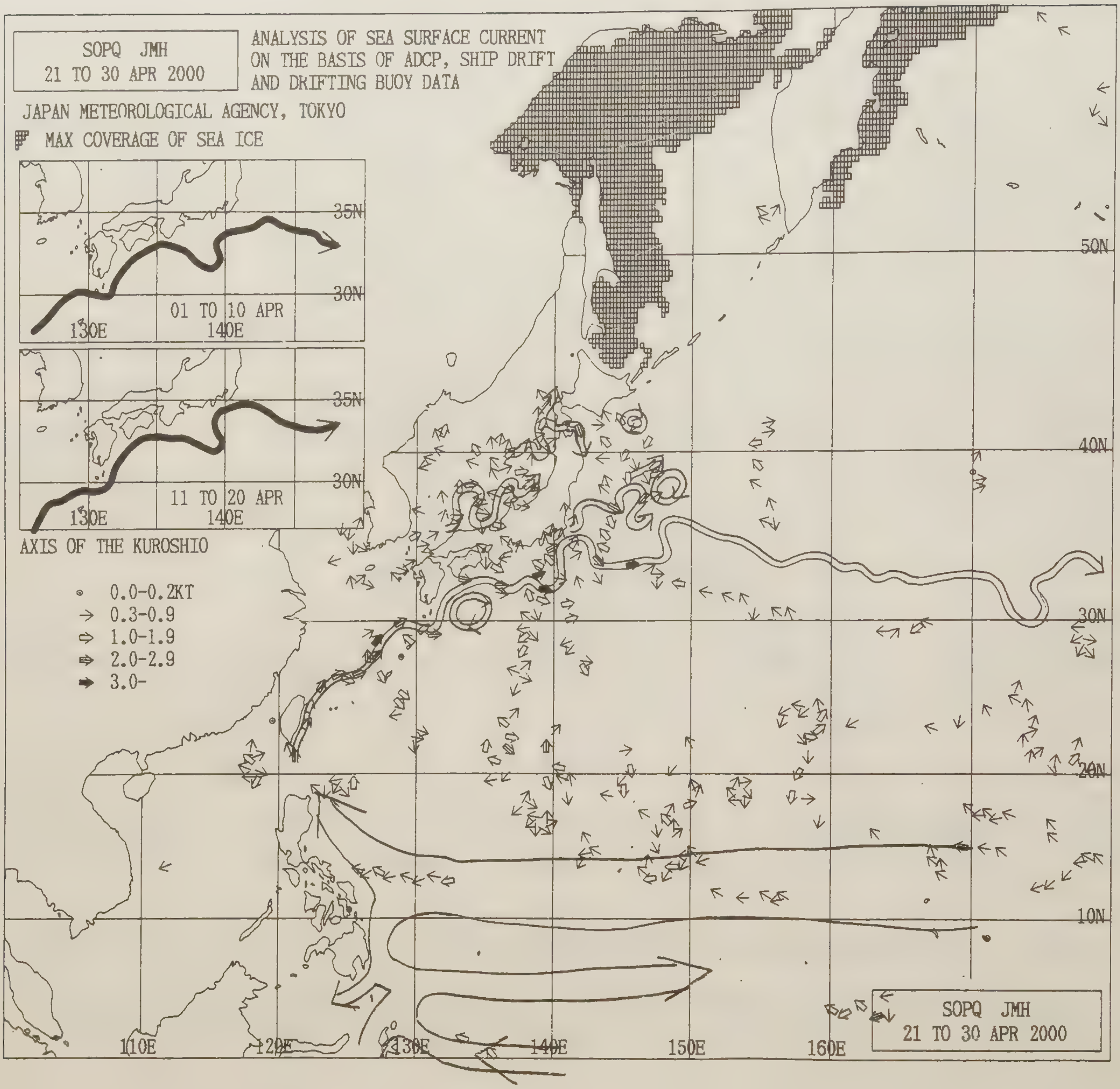
Fig.6 Subsurface (200 m) temperatures in the seas adjacent to Japan for APR 2000. Contour interval is 1°C. Observation points are denoted by dots.

400m Temperatures in the Seas Adjacent to Japan



第7図　日本近海表層水温図(深さ400 m) (2000年 4月)

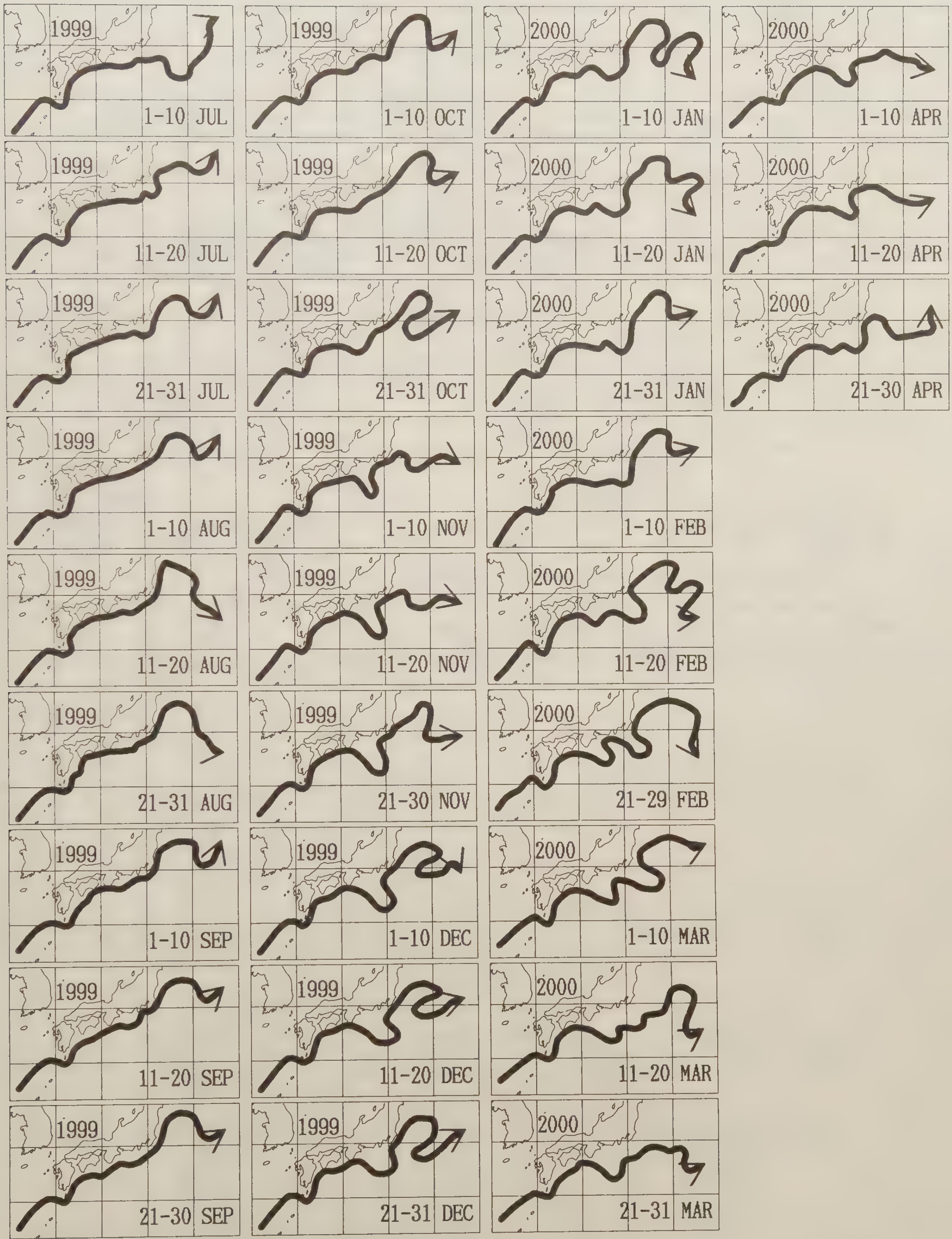
Fig.7 Subsurface (400 m) temperatures in the seas adjacent to Japan for APR 2000. Contour interval is 1°C. Observation points are denoted by dots.



第８図　北西太平洋海流図（2000 年４月下旬）

Fig. 8　Analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in April 2000. Small arrows indicate *in situ* observations. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.

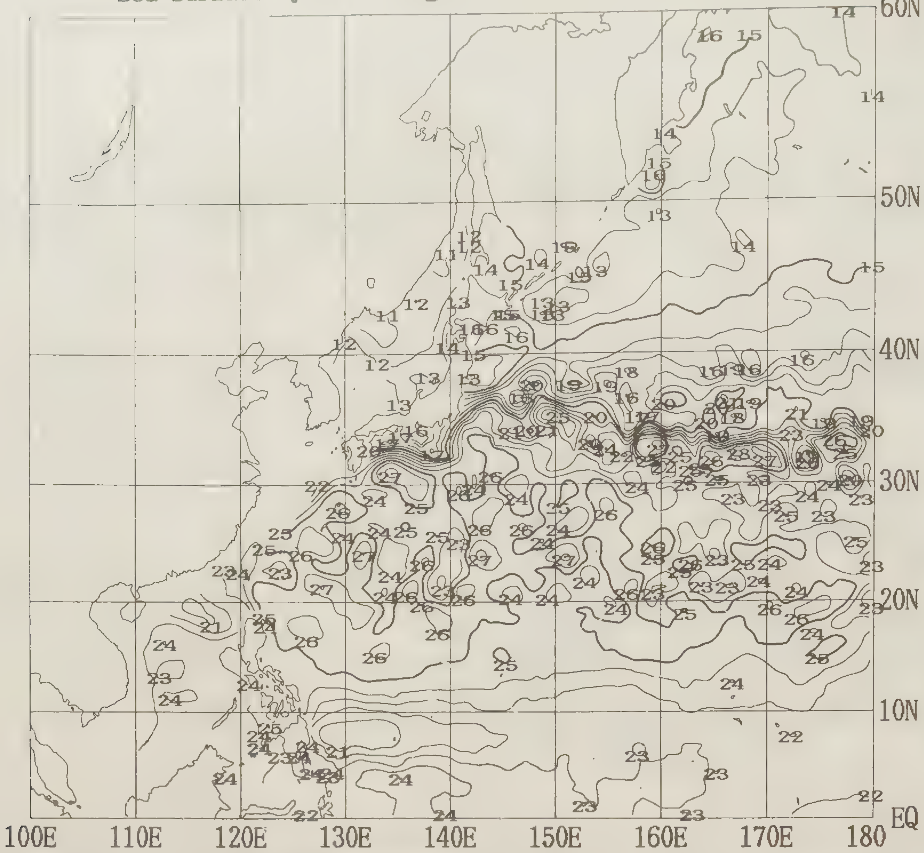
Location of the Kuroshio axis



第9図 旬別黒潮流軸図

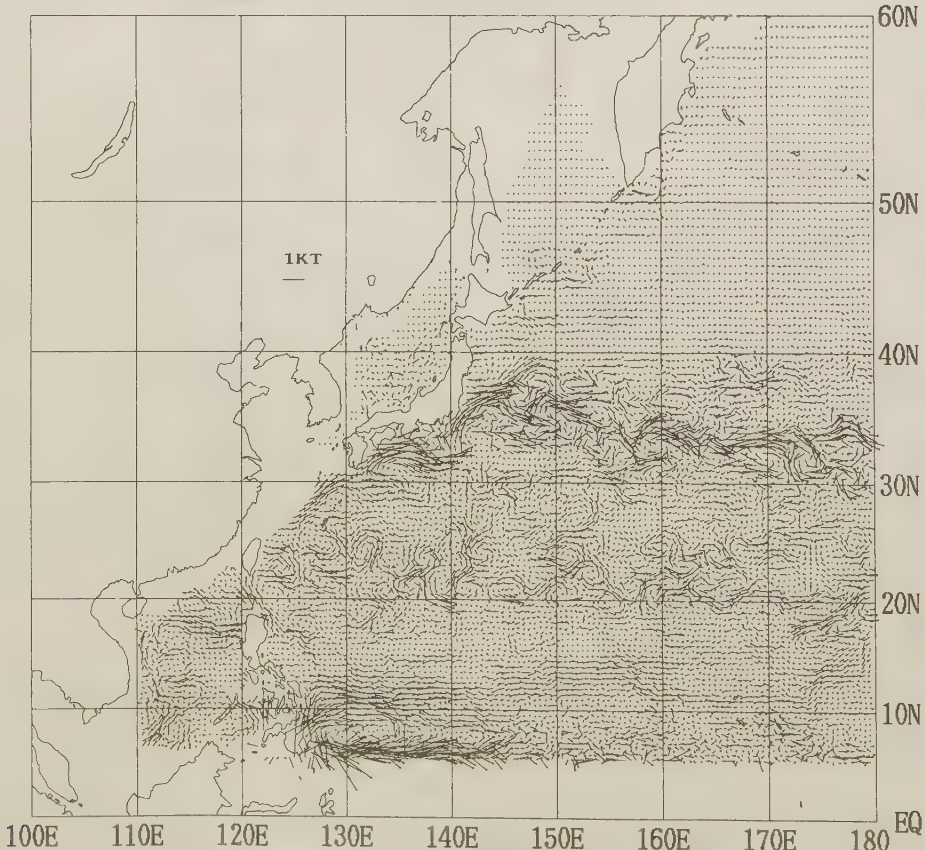
Fig.9 Location of the Kuroshio axis

Sea surface dynamic heights and current distribution



第10図 北西太平洋力学的海面高度分布図(2000年 4月25日)

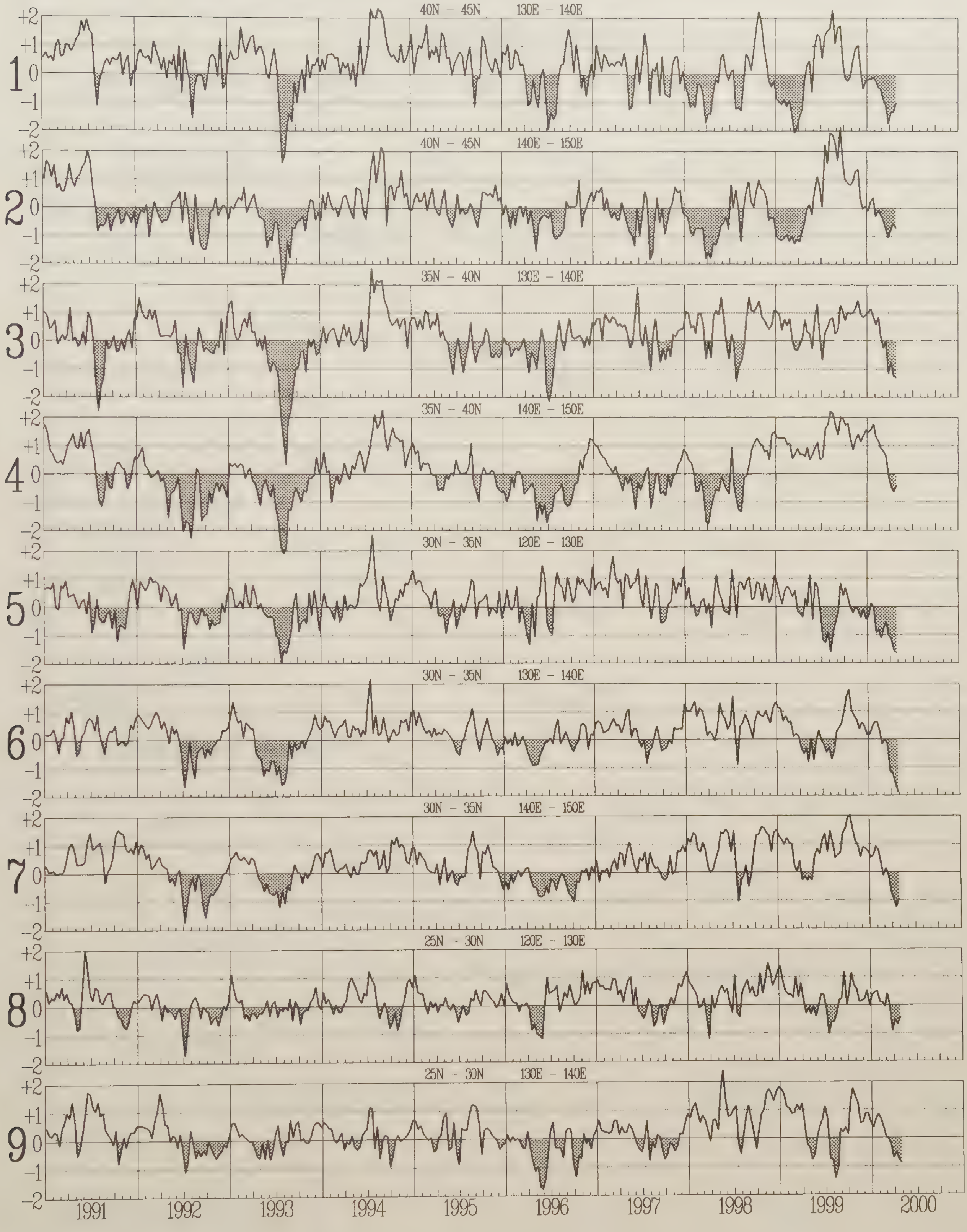
Fig.10 Sea surface dynamic heights (10 cm) in the western North Pacific derived from the altimeter data of TOPEX/POSEIDON (APR 25, 2000).
1500 db surface is assumed to be the surface of no motion.

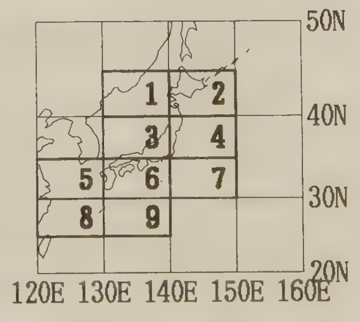


第11図 北西太平洋海流ベクトル図(2000年 4月25日)

Fig.11 Sea surface current vectors in the western North Pacific (APR 25, 2000).
Vectors are derived from the sea surface dynamic heights from TOPEX/POSEIDON and subsurface temperature distribution assuming the geostrophic relation.

Time Series of Area Mean SST in the Western North Pacific

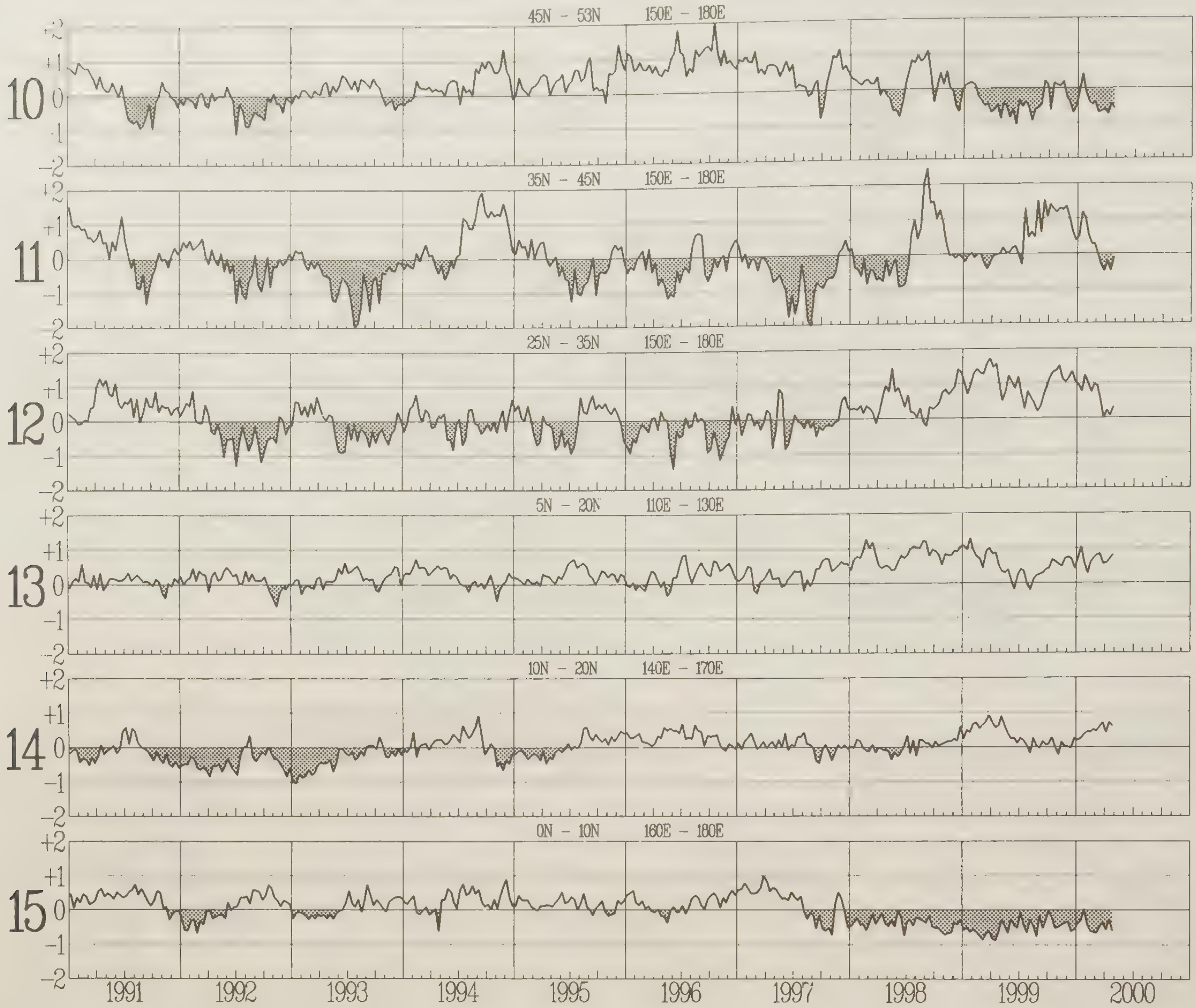




第12図　海域別旬平均海面水温平年偏差時系列図

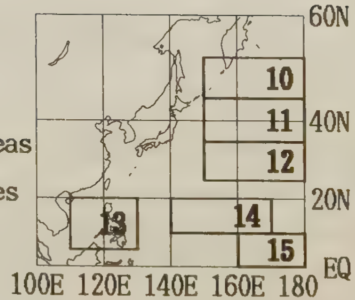
Fig.12 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

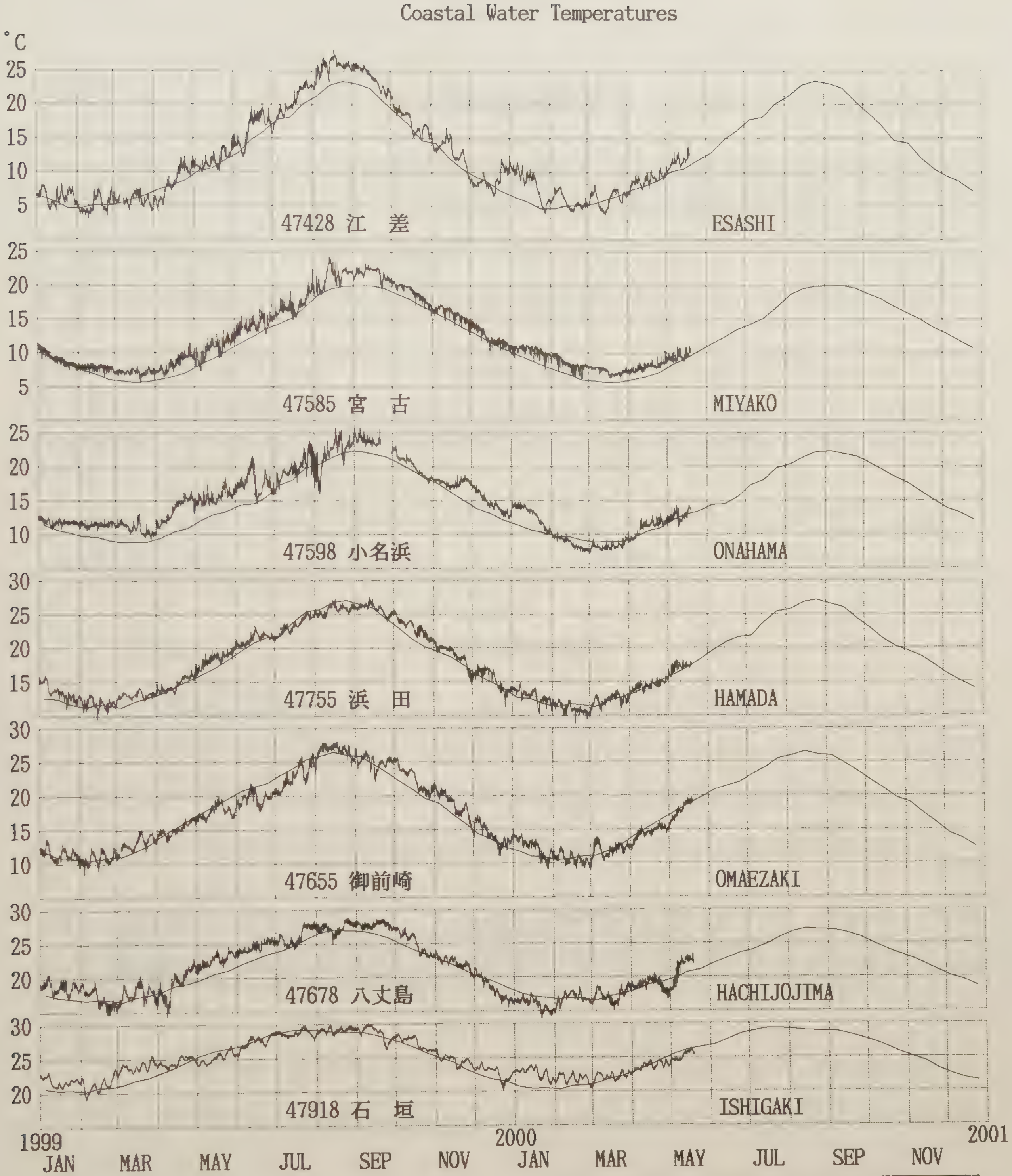
Time Series of Area Mean SST in the Western North Pacific

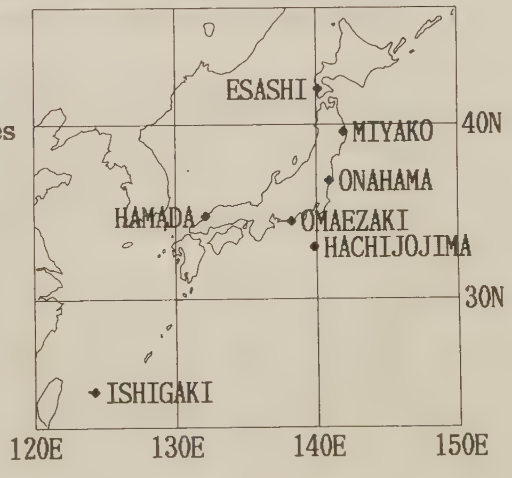


第12図　海域別旬平均海面水温平年偏差時系列図（つづき）

Fig.12 (continue) Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).



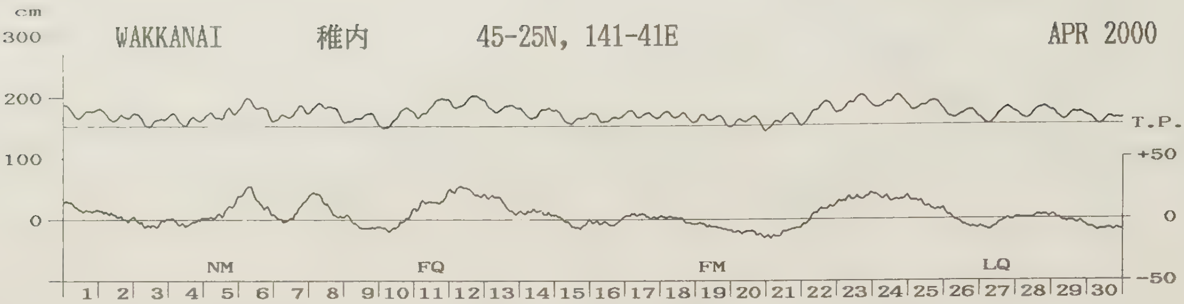


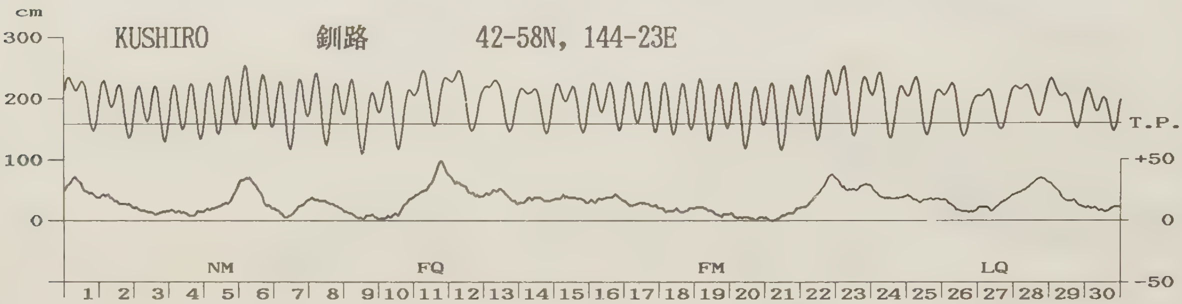


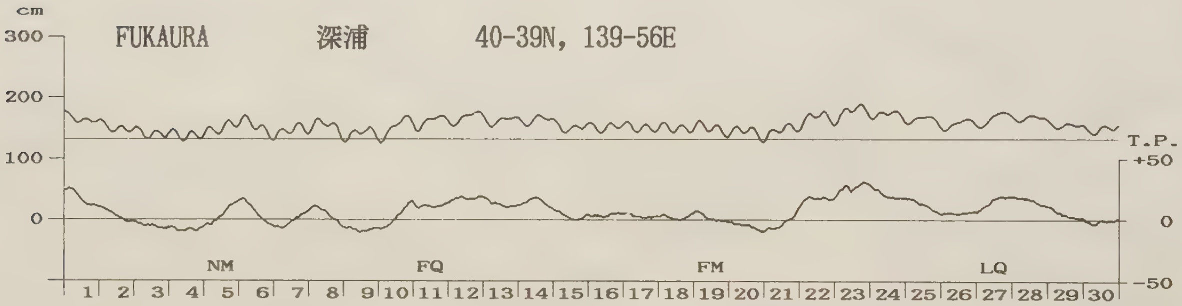
第13図 沿岸水温時系列図

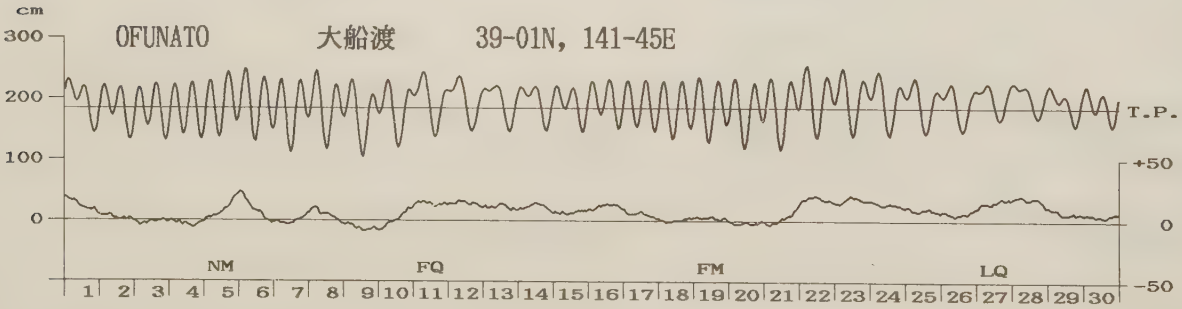
Fig.13 Time series of hourly coastal water temperatures (°C) measured at 7 coastal stations of the JMA shown in the right panel.
Thin lines show ten-day mean climatology.

Time Series of Sea Level





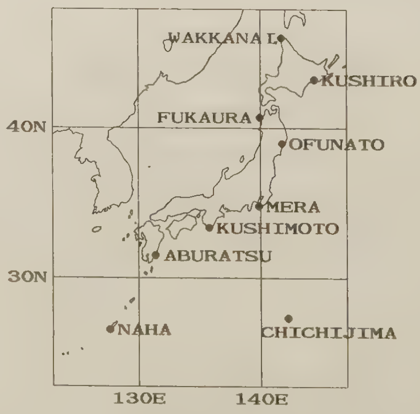


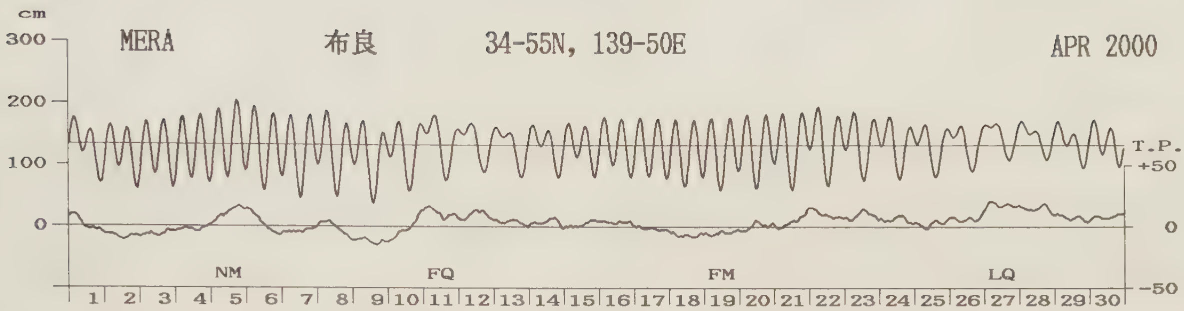


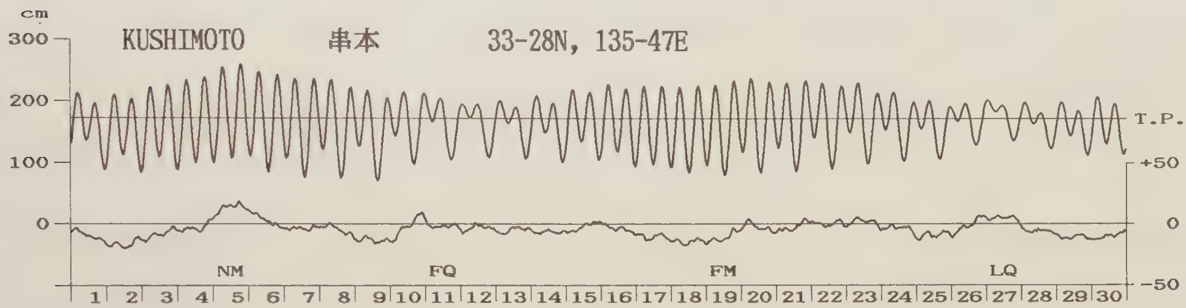
第14図 沿岸潮位時系列図 (2000年 4月)

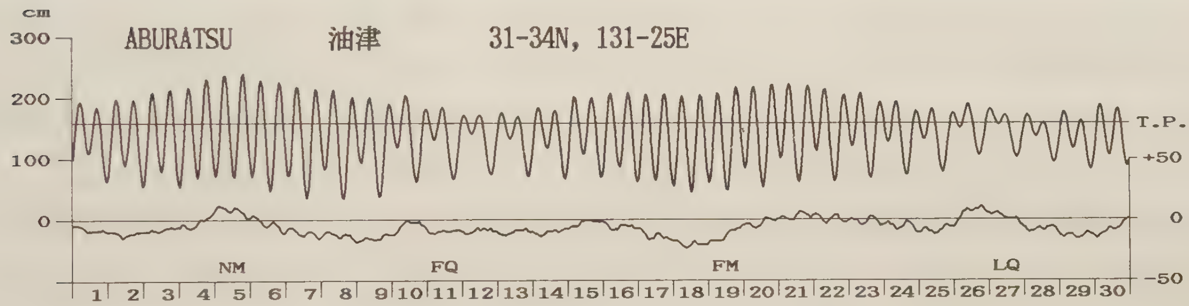
Fig.14 Time series of hourly sea level observation (upper line) and its anomalies (lower line) at 9 stations of the JMA in the right panel.
Short term variations are removed from raw data.

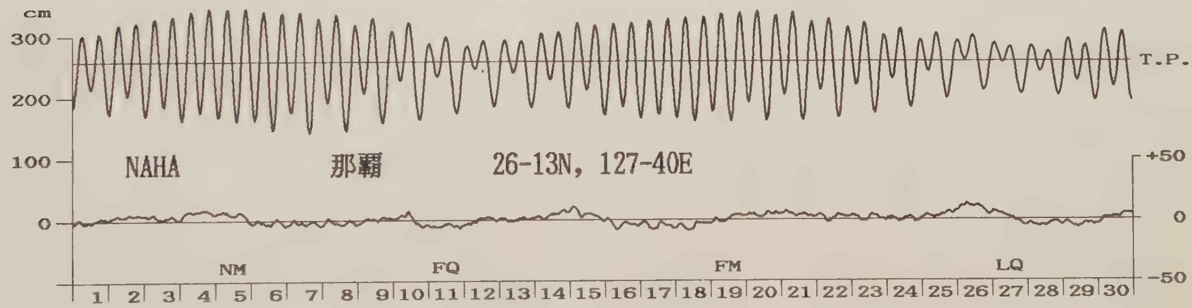
NM: new moon, FQ: first quarter
FM: full moon, LQ: last quarter
T.P.: Mean sea level of Tokyo Bay (Tokyo Peil)

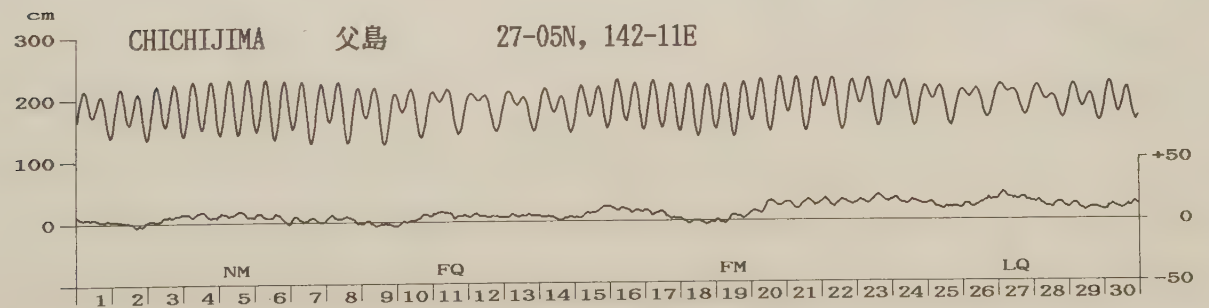








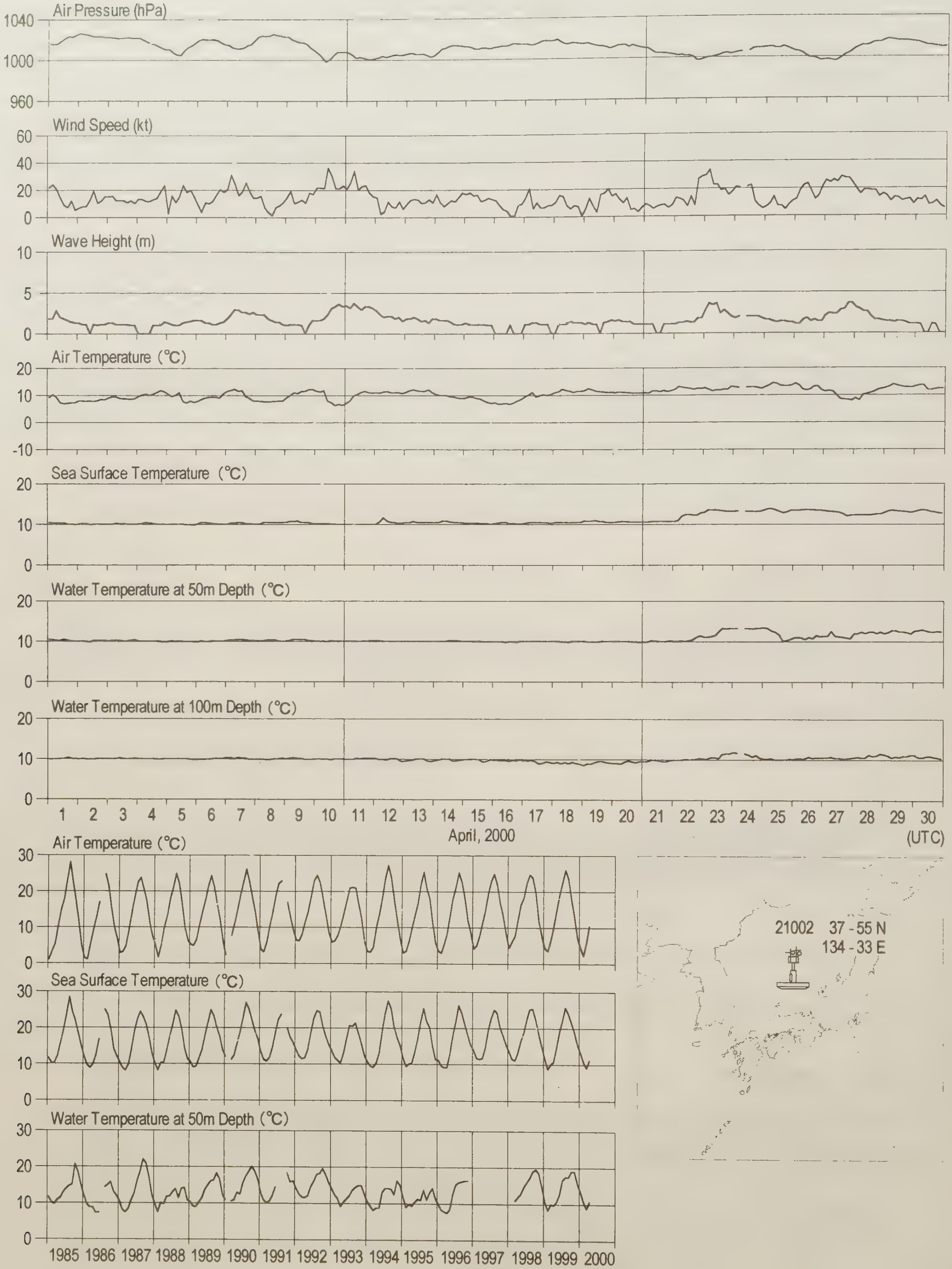




第14図 つづき

Fig.14 continue

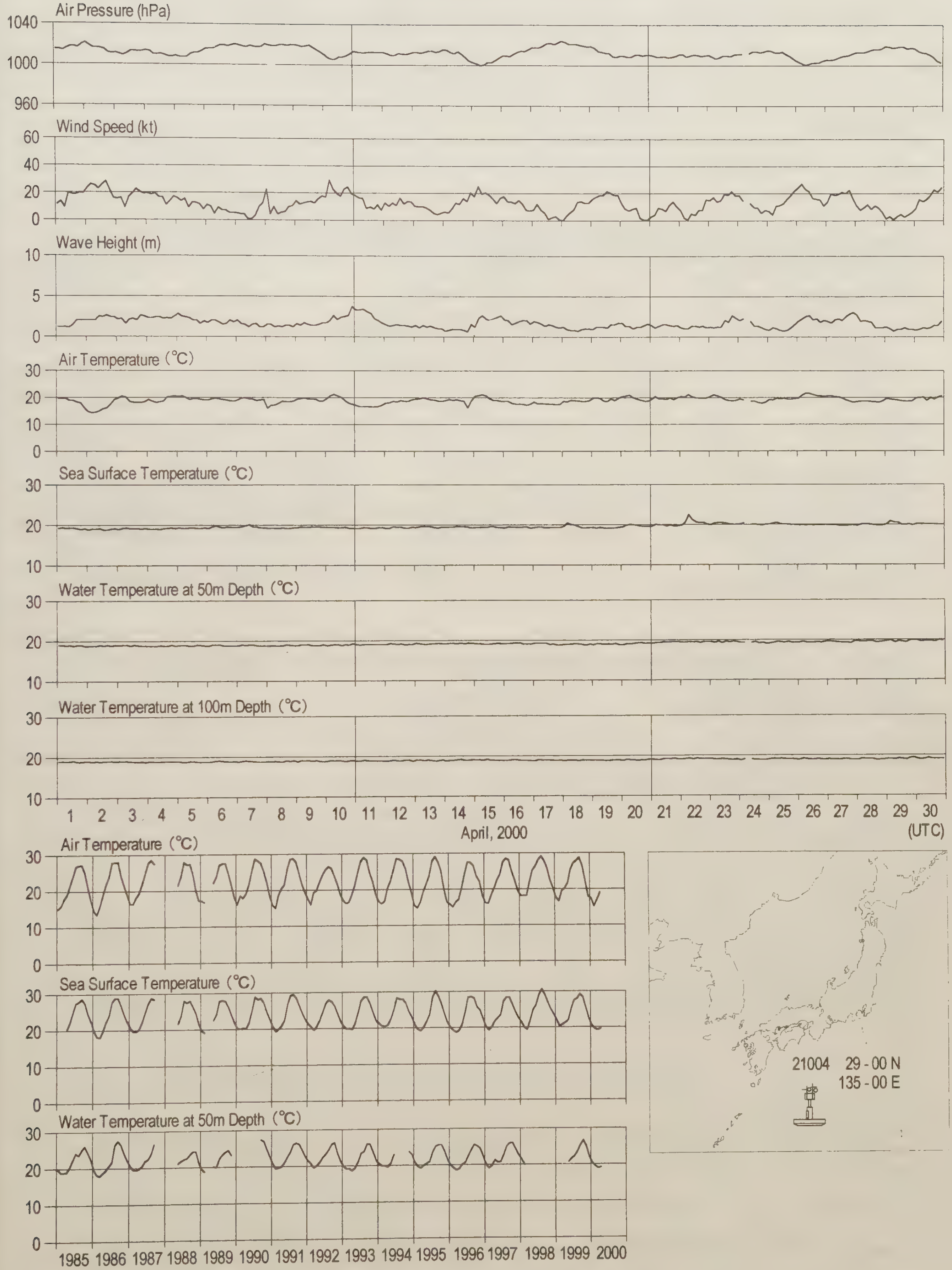
Ocean Data Buoy Observations



第15図　海洋気象ブイロボットによる観測要素の時系列図（日本海：21002）
上段は３時間毎の観測値を、下段は月平均値を示す。

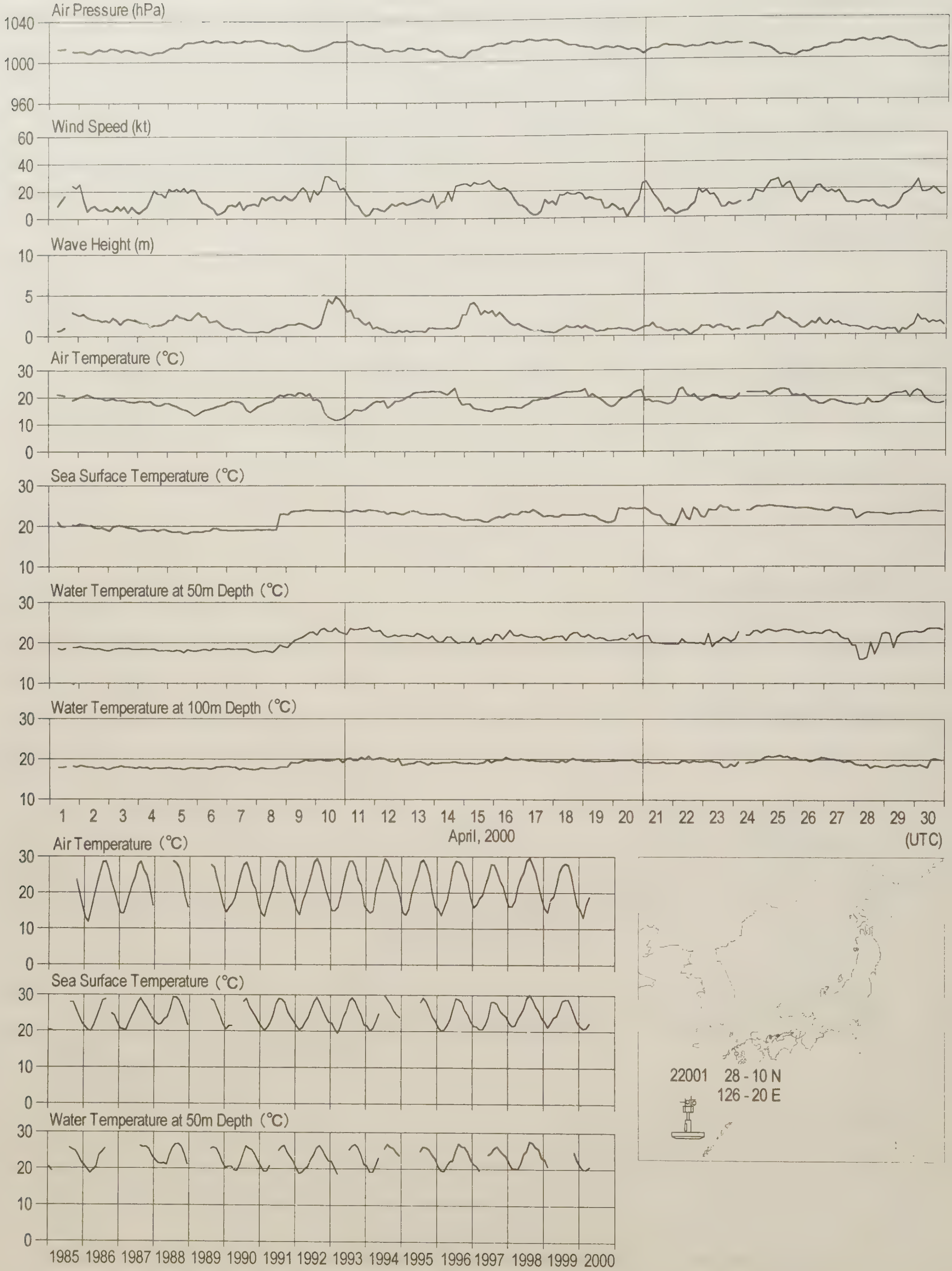
Fig.15　Time series of JMA buoy observation in the Japan Sea (WMO ID No. 21002).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

Ocean Data Buoy Observations



第15図　海洋気象ブイロボットによる観測要素の時系列図（四国沖：21004）
上段は３時間毎の観測値を、下段は月平均値を示す。

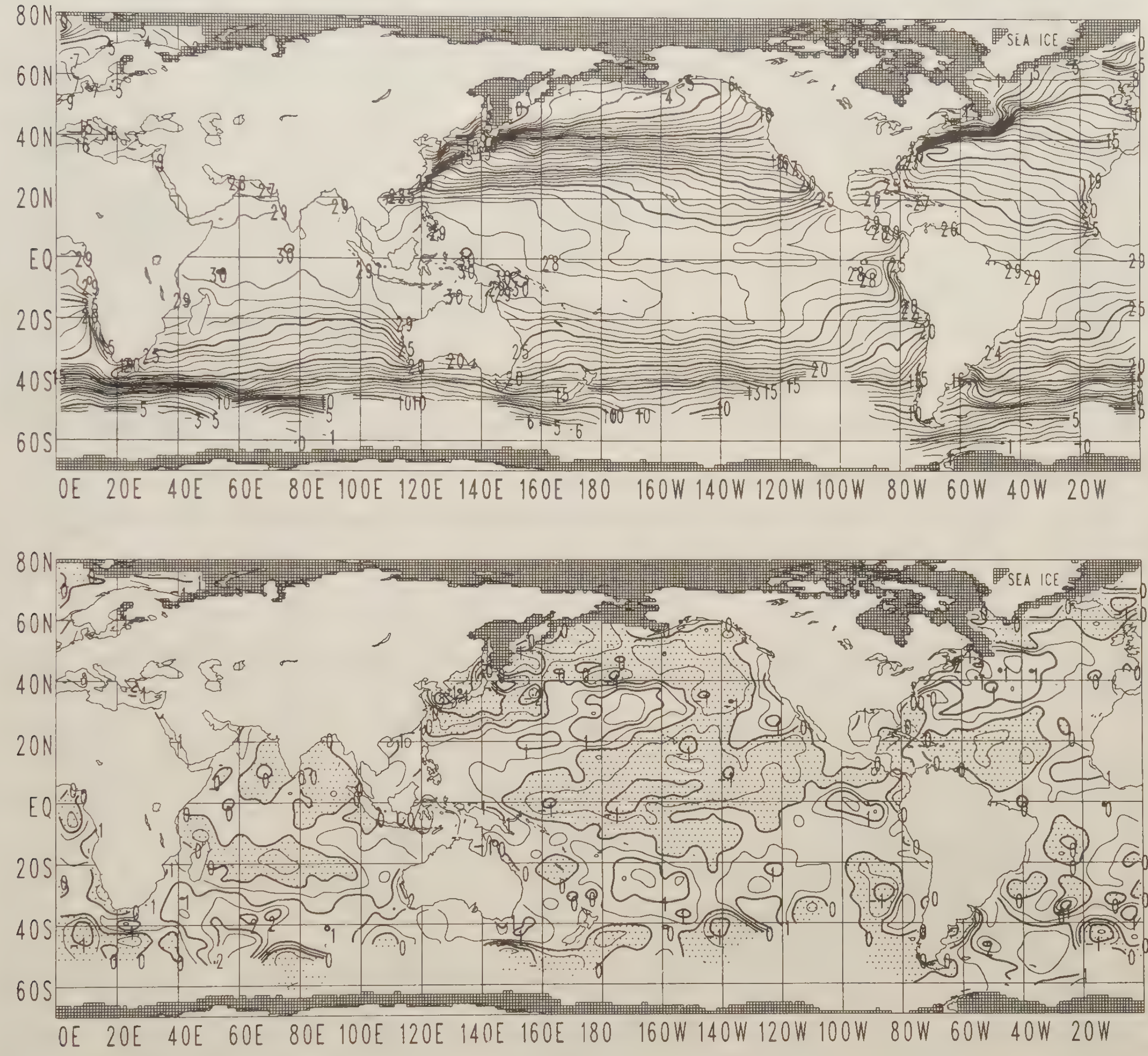
Fig.15　Time series of JMA buoy observation south of Shikoku (WMO ID No. 21004).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



第15図　海洋気象ブイロボットによる観測要素の時系列図（東シナ海：22001）
上段は３時間毎の観測値を、下段は月平均値を示す。

Fig.15　Time series of JMA buoy observation in the East China Sea (WMO ID No. 22001).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

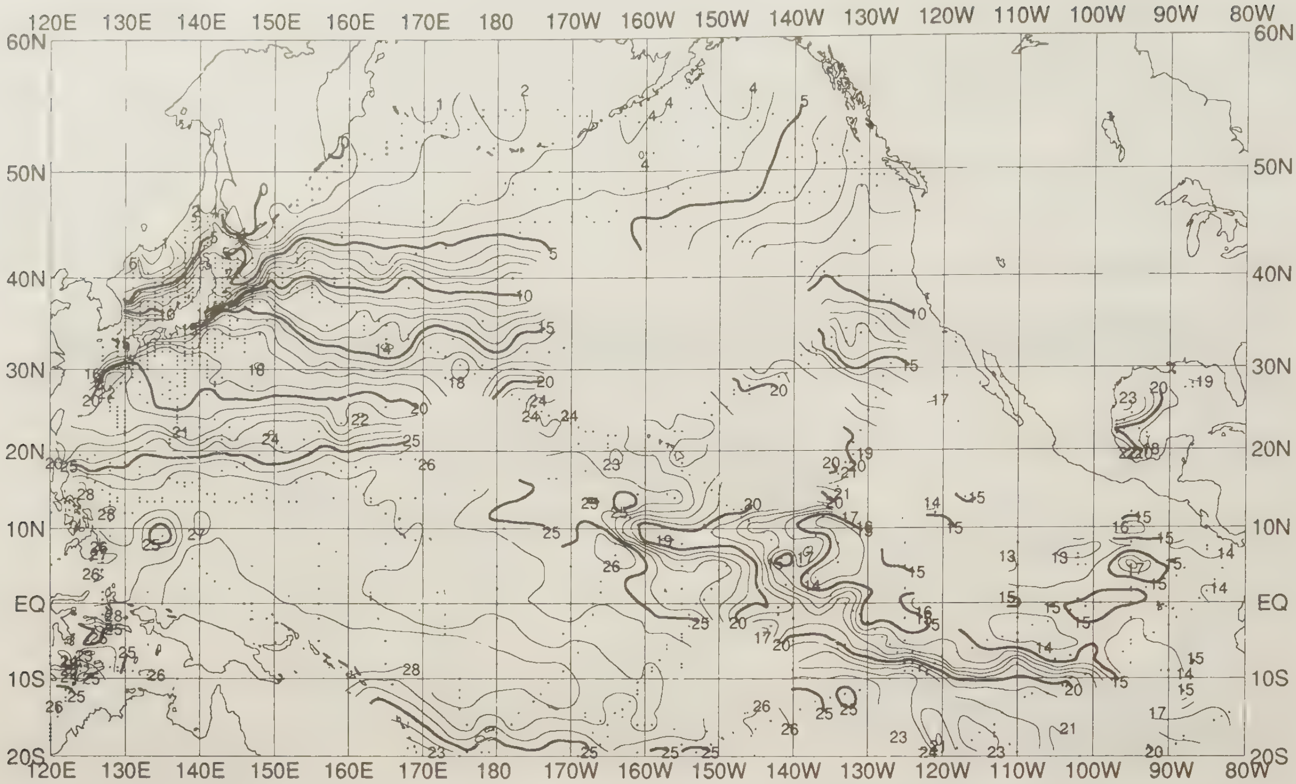
SST & Anomalies in the Global Ocean



第16図　全球月平均海面水温図（上）及び偏差図（下）（2000年 4月）

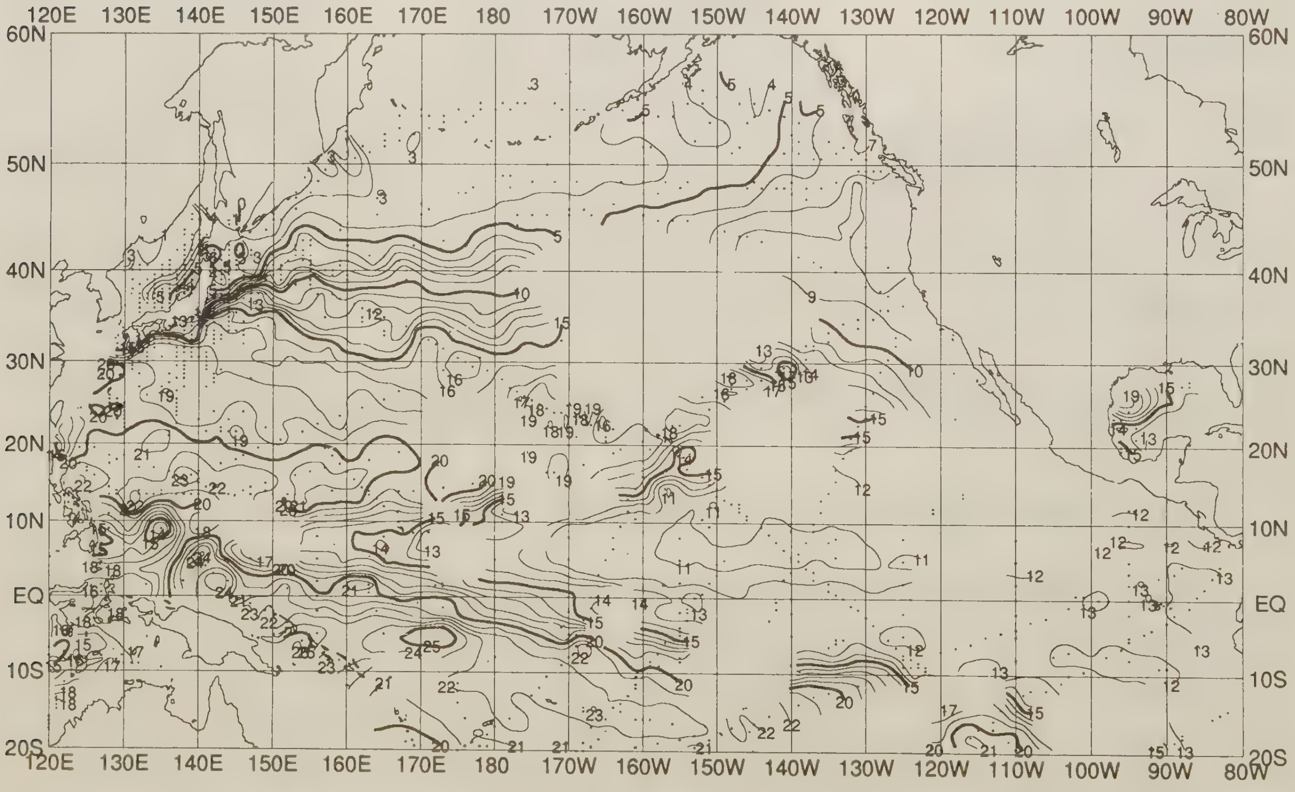
Fig.16　Monthly mean sea surface temperature over the global ocean (top) and anomalies (bottom) for APR 2000.　Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C (top) and additional anomaly contours of ±0.5°C are shown by thin lines.　Negative anomalies are spotted.　Maximum coverage of sea ice is shaded.　Data sources for sea ice are U.S. National Ice Center (polar regions) and JMA (the Sea of Okhotsk).

100m/200m Temperatures in the Pacific Ocean



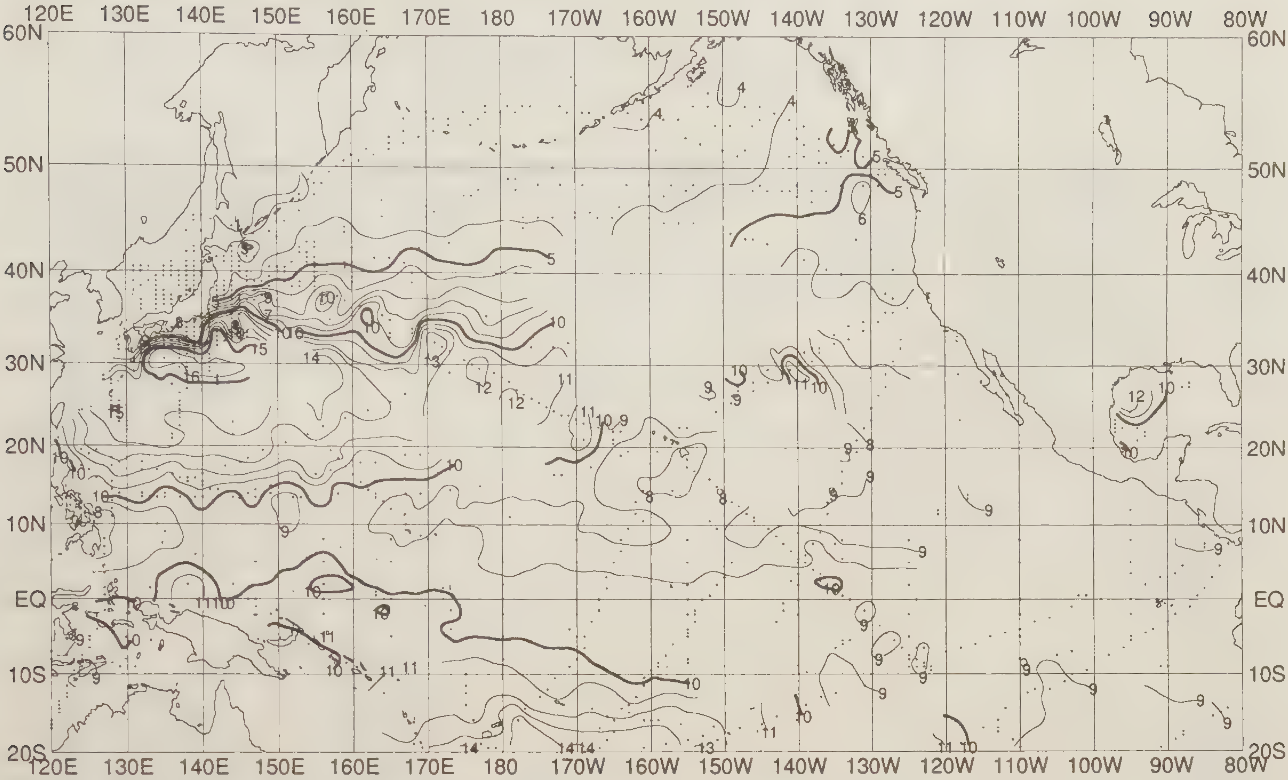
第 17 図　太平洋表層水温図（深さ 100 m）（2000 年 4 月）

Fig. 17　Subsurface (100 m) temperatures in the Pacific Ocean for April 2000. Contour interval is 1 °C. Observation points are denoted by dots.



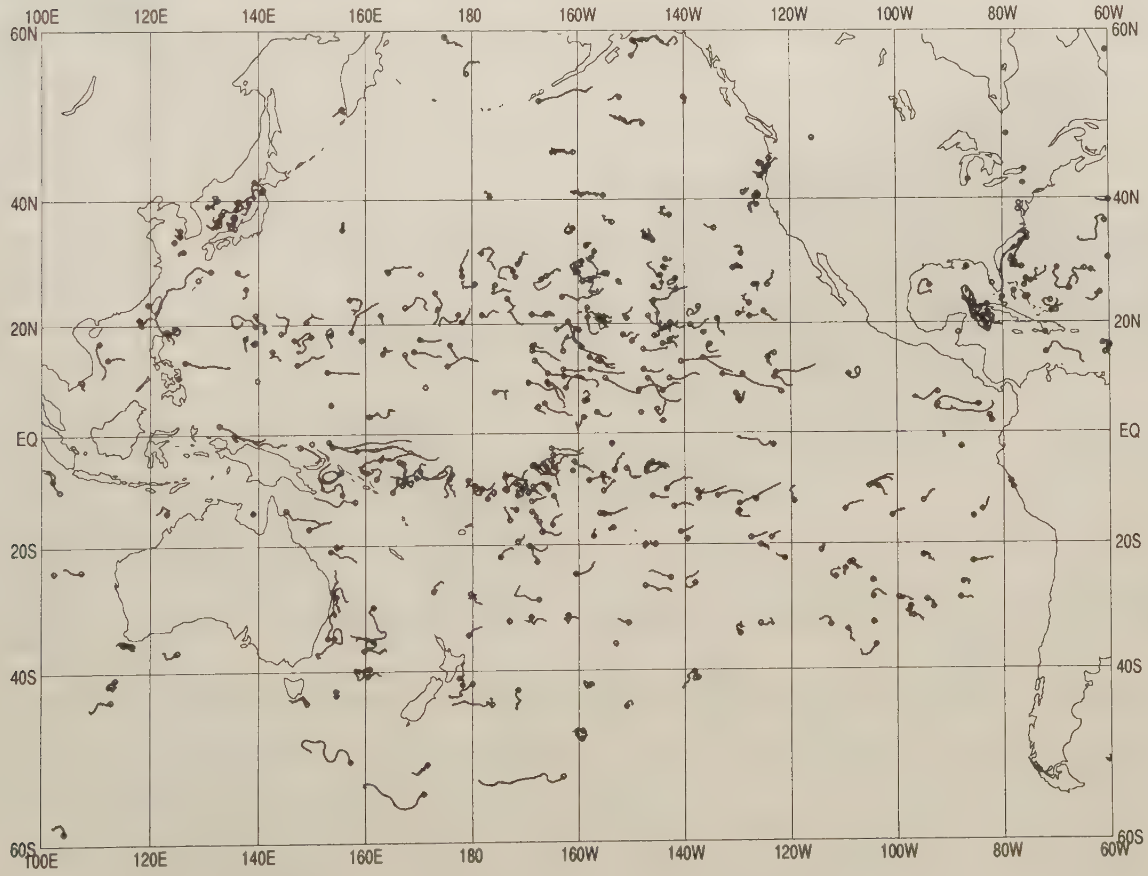
第 18 図　太平洋表層水温図（深さ 200 m）（2000 年 4 月）

Fig. 18　Subsurface (200 m) temperatures in the Pacific Ocean for April 2000. Contour interval is 1 °C. Observation points are denoted by dots.



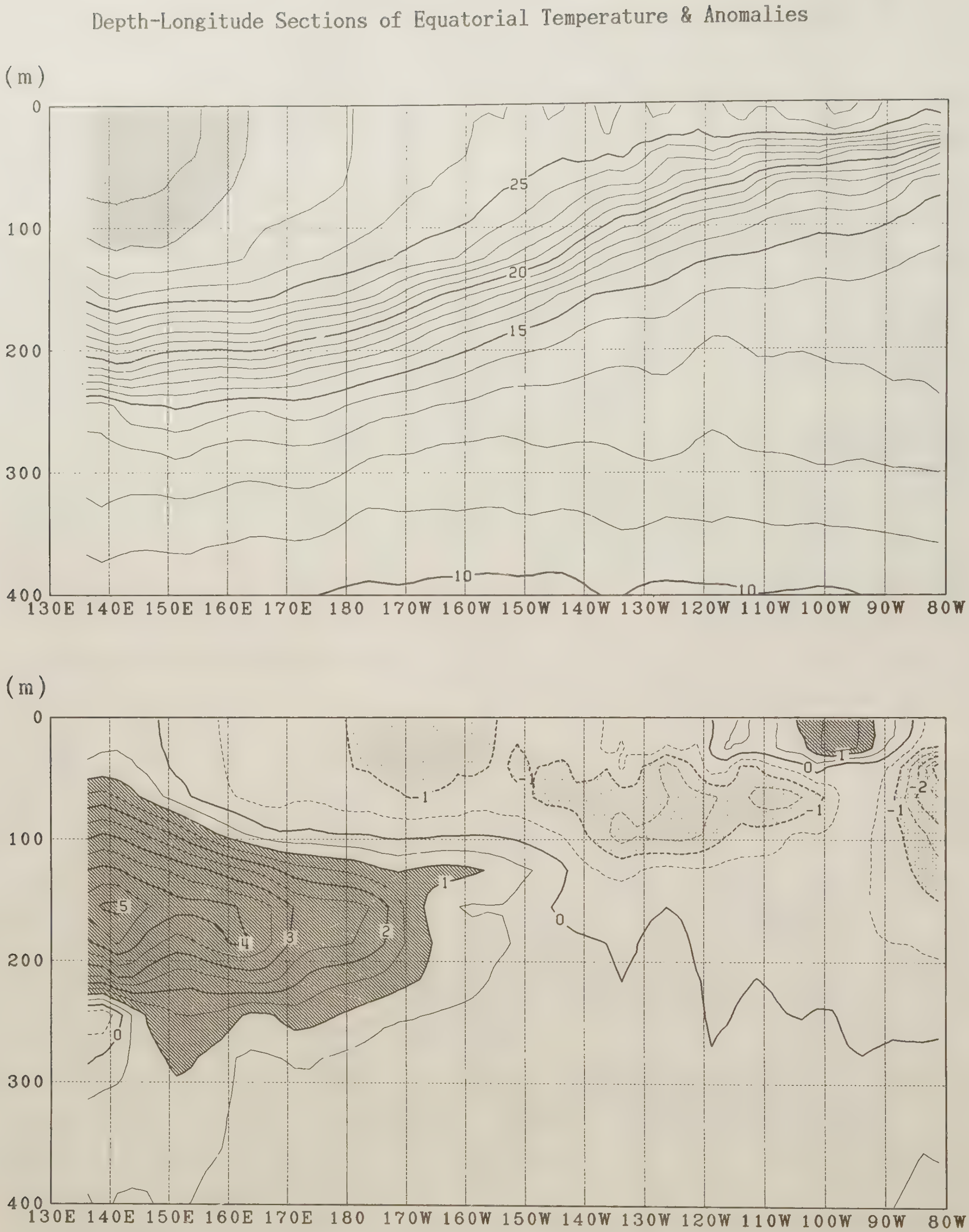
第 19 図　太平洋表層水温図（深さ 400 m）（2000 年 4 月）

Fig. 19　Subsurface (400 m) temperatures in the Pacific Ocean for April 2000. Contour interval is 1 ℃. Observation points are denoted by dots.



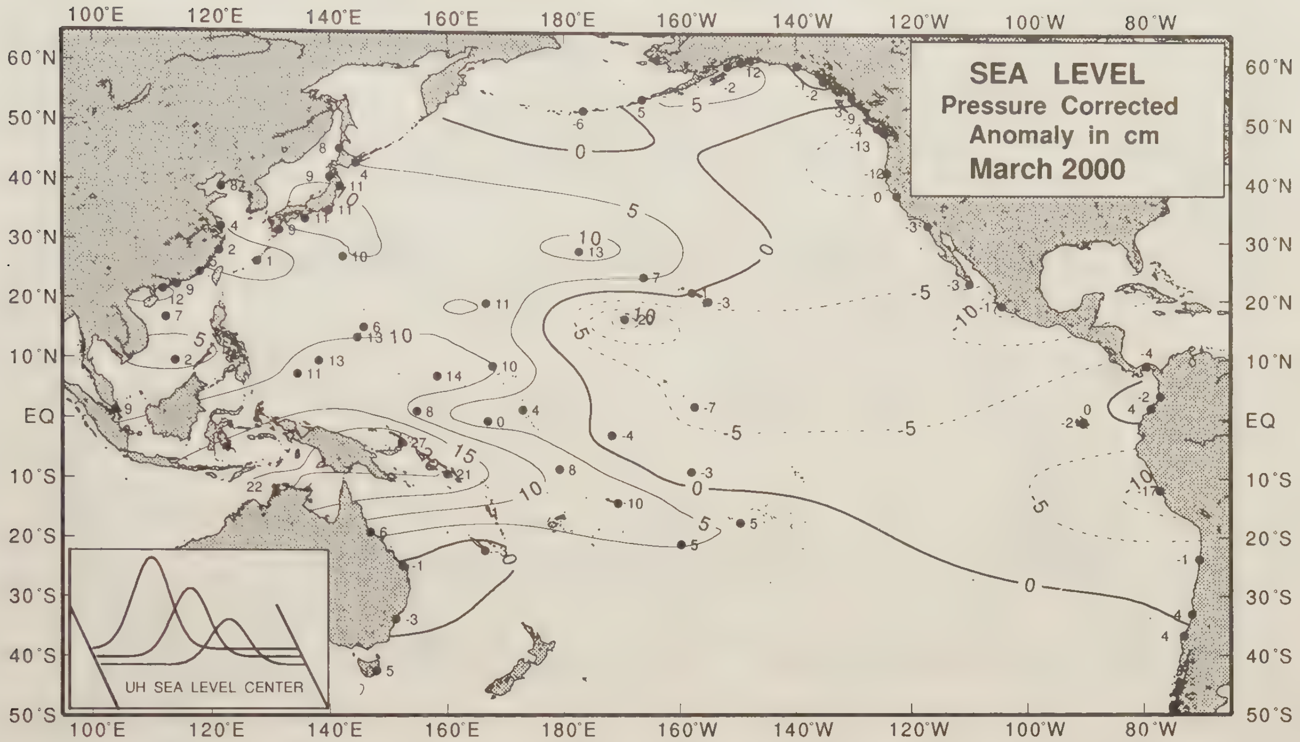
第 20 図　太平洋ブイ流跡図（2000 年 4 月）

Fig. 20　Movements of drifting buoys in the Pacific Ocean during April 2000. Each track is for one buoy. Small circles represent the last positions for the month.



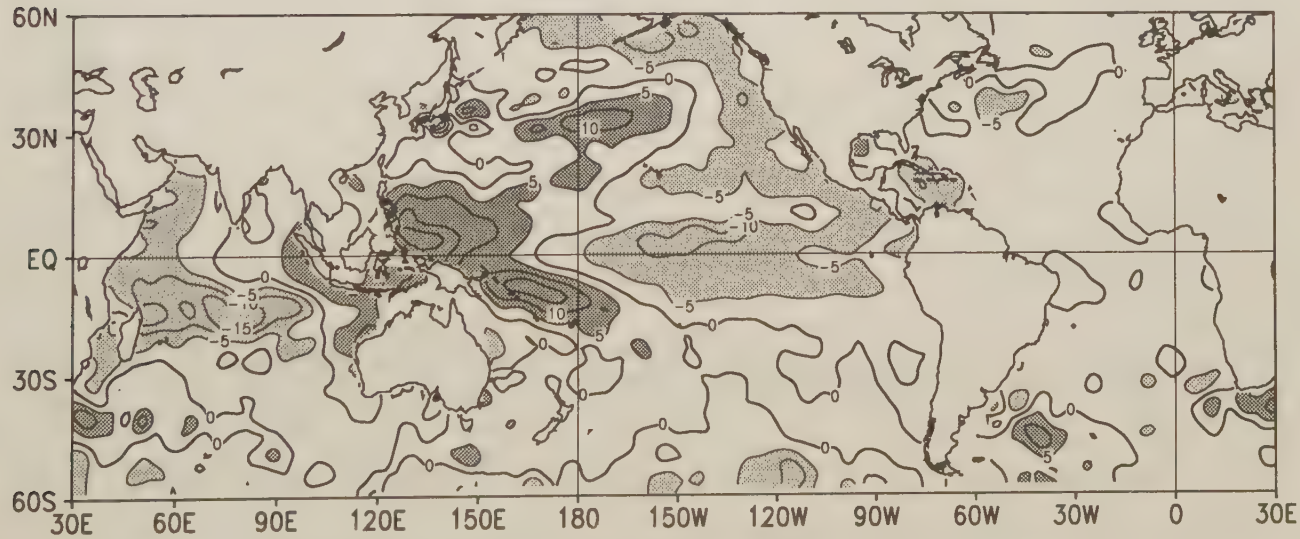
第21図　太平洋赤道に沿う表層水温（上）及び偏差（下）の深度－経度断面図（2000年 4月）

Fig.21 Depth-longitude sections of temperature (top) and anomalies (bottom) along the equator in the Pacific Ocean for APR 2000. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (top) and 0.5°C (bottom). Values greater than 28°C in the top panel are shaded. In the bottom panel, values greater than 1°C are shaded and values less than -1°C are spotted. Anomalies are computed from 1987-1999 base period means.



第 22 図　太平洋月平均海面水位偏差図 (2000 年 3 月)

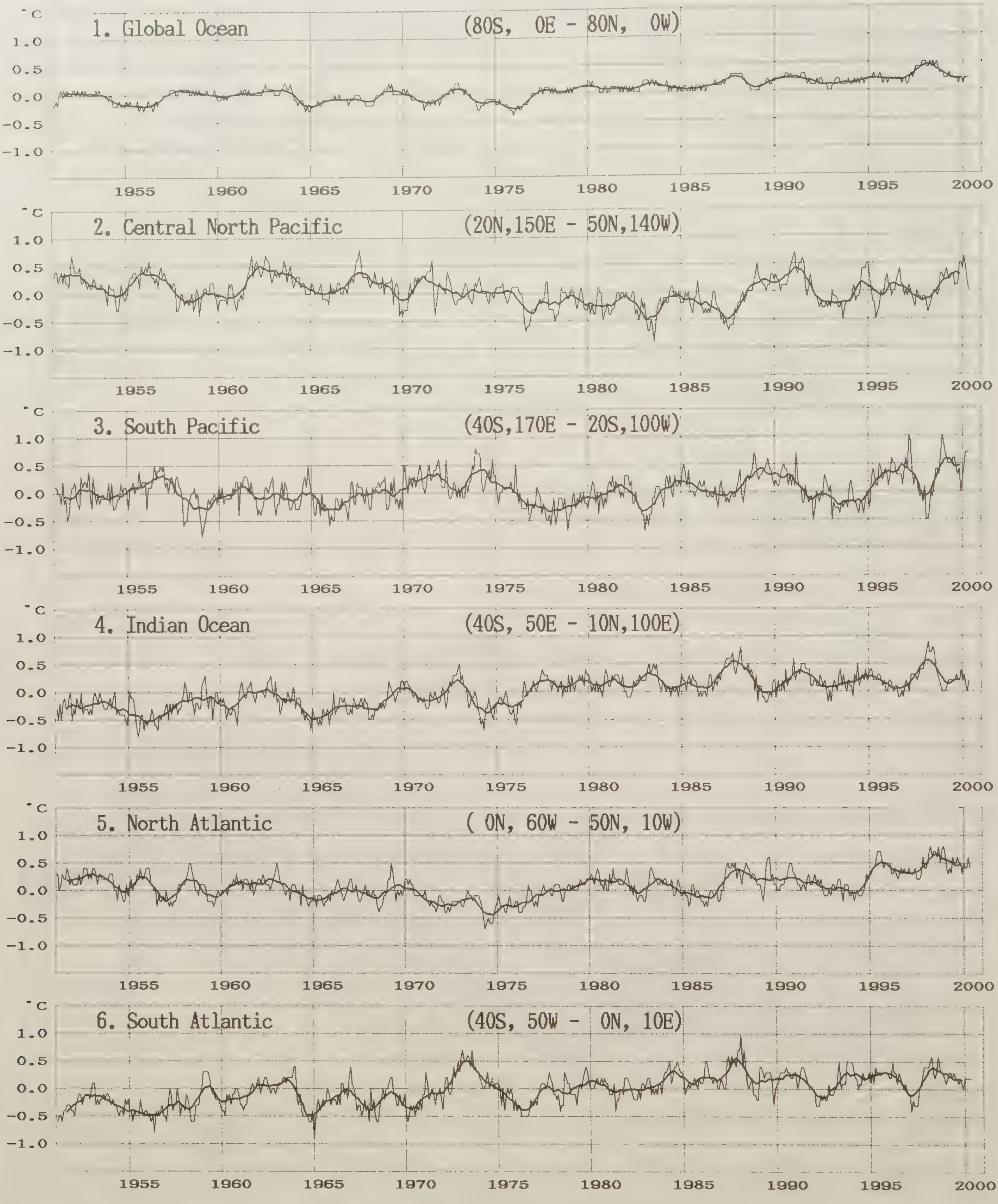
Fig. 22　Monthly sea level anomalies for March 2000 obtained from mean sea level (1975-1995) adjusted for atmospheric pressure. This figure is prepared by the SOC of ISLP-PAC, Department of Oceanography, University of Hawaii.



第 23 図　全球月平均海面高度偏差図 (2000 年 3 月)

Fig. 23　Monthly sea surface height anomalies in the global ocean derived from the altimeter data of TOPEX/POSEIDON for March 2000. Contour interval is 5 cm. Positive anomalies exceeding +5 cm are shaded and negative anomalies exceeding -5 cm are spotted. Anomalies are computed from 1993-1998 base period means.

Long-term Variation of Monthly Mean SST Anomalies

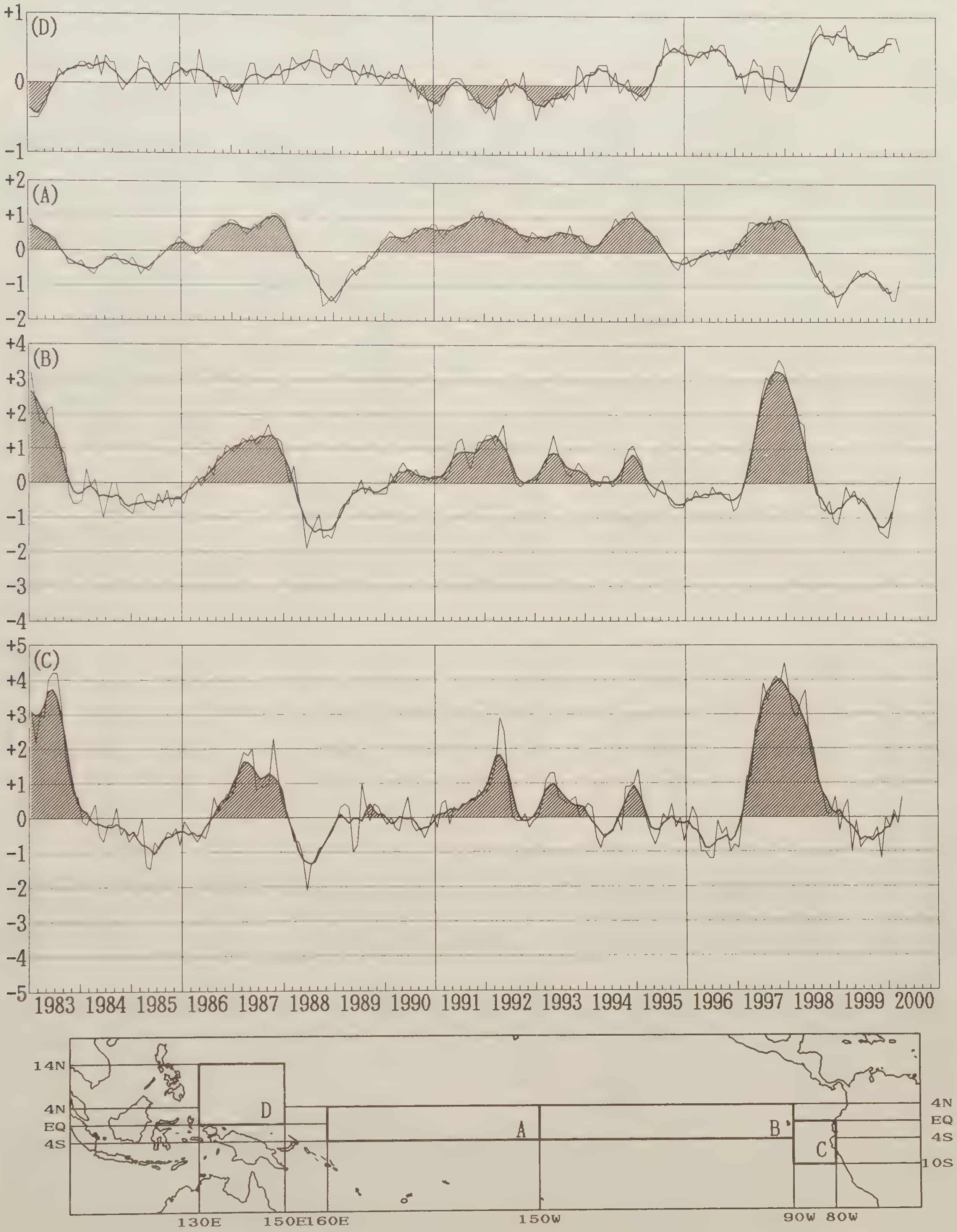


第24図 海域平均海面水温偏差の長期変動



Fig.24 Long-term variations of monthly mean sea surface temperature anomalies (°C) for the areas shown in the right panel. Anomalies are computed from the JMA climatology (1961-90). Thin lines show the monthly mean and thick lines their 13-month running means.

Time Series of Equatorial Pacific SST Anomalies



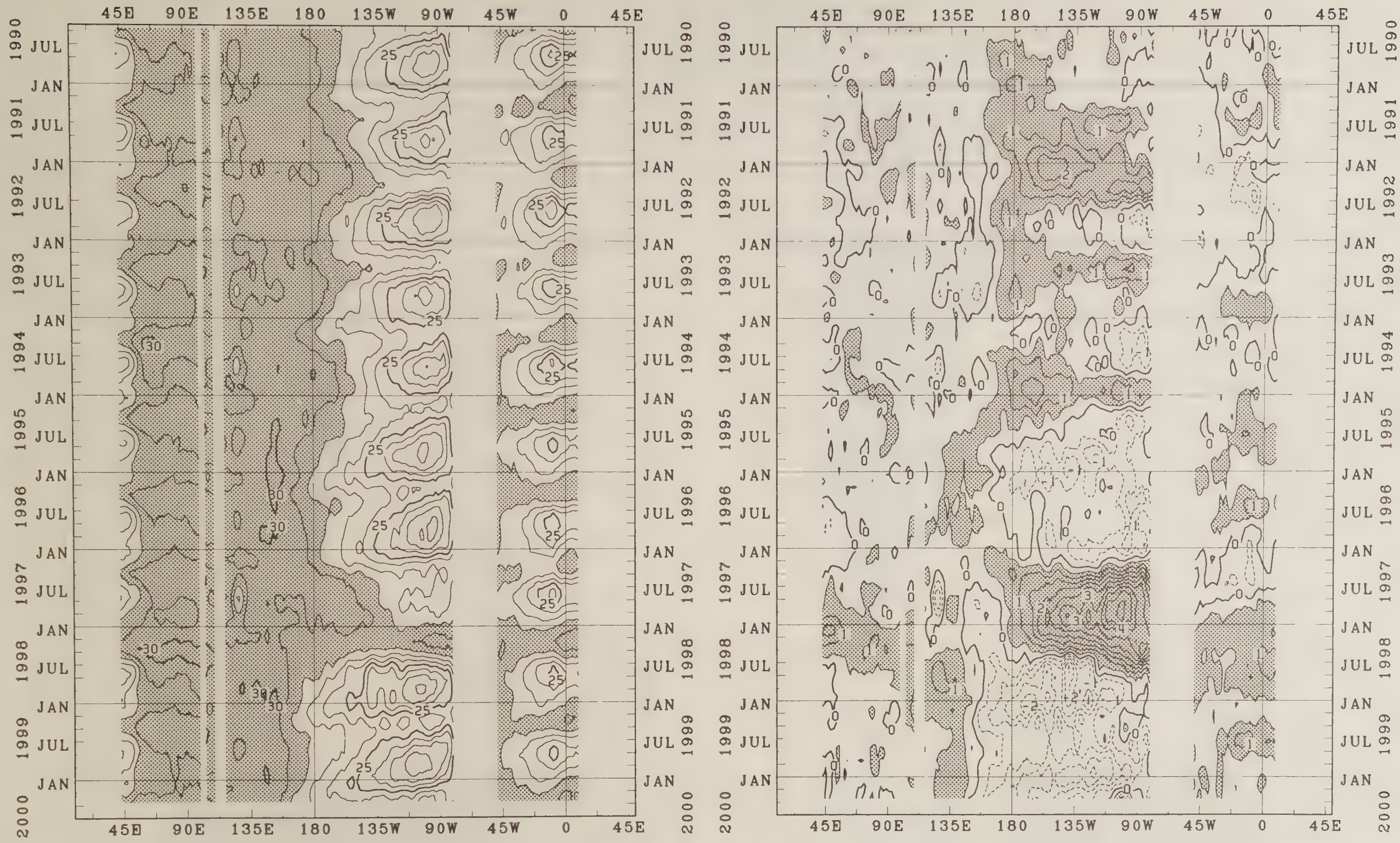
第25図　太平洋赤道域の海面水温偏差時系列図

Fig.25 Time series of monthly mean SST anomalies (°C) in the equatorial Pacific Ocean for the areas indicated at the bottom panel. Thin lines show the monthly means and thick lines their 5-month running means. Positive anomalies (A, B, C) and negative anomalies (D) are shaded. Anomalies are computed from the JMA climatology (1961-1990).

	SEA SURFACE TEMPERATURE AND ANOMALY (°C)								SOI	SEA LEVEL PRESSURE ANOMALY (hPa)	
MONTH YEAR	REGION D 14N-EQ 130E-150E		REGION A 4N-4S 160E-150W		REGION B 4N-4S 150W-90W		REGION C EQ-10S 90W-80W		SOI	TAHITI 17-33S 149-37W	DARWIN 12-24S 130-52E
JAN 98	28.3	-0.2	29.0	1.0	28.4	3.0	28.0	3.7	-2.3	-3.6	1.4
FEB 98	28.1	-0.2	28.8	0.8	28.8	2.6	28.8	3.1	-1.8	-0.9	3.5
MAR 98	28.3	-0.1	28.6	0.5	29.0	2.1	28.8	2.9	-2.5	-2.8	2.3
APR 98	28.8	0.0	28.5	0.3	28.9	1.8	28.5	3.4	-2.3	-1.5	1.4
MAY 98	29.3	0.2	28.7	0.2	28.3	1.7	27.6	3.7	0.0	0.4	0.5
JUN 98	29.7	0.4	28.4	-0.1	26.1	0.0	24.7	2.0	1.1	0.9	-0.5
JUL 98	29.9	0.7	28.0	-0.5	25.3	0.1	23.2	1.6	1.5	1.8	-0.6
AUG 98	29.9	0.8	27.7	-0.7	24.5	-0.1	21.7	1.1	1.0	1.4	-0.2
SEP 98	30.1	0.9	27.8	-0.5	23.9	-0.7	21.0	0.7	1.0	1.4	-0.4
OCT 98	30.0	0.7	27.3	-1.1	23.8	-0.8	20.8	0.1	1.2	0.8	-1.1
NOV 98	29.9	0.7	27.2	-1.2	24.1	-0.5	21.6	0.1	1.0	0.4	-1.5
DEC 98	29.5	0.6	27.1	-1.1	23.8	-1.1	23.2	0.6	1.5	1.1	-1.5
JAN 99	29.3	0.8	26.4	-1.6	24.2	-1.2	23.9	-0.4	1.5	1.8	-1.5
FEB 99	29.1	0.8	26.7	-1.3	25.5	-0.7	25.9	0.2	0.8	1.3	-0.6
MAR 99	29.3	0.9	27.0	-1.1	26.8	-0.1	26.4	0.5	0.8	0.4	-1.3
APR 99	29.3	0.5	27.3	-0.9	26.7	-0.4	24.1	-1.0	1.8	1.3	-0.9
MAY 99	29.7	0.6	27.8	-0.7	26.4	-0.2	23.8	-0.1	0.3	1.1	1.1
JUN 99	29.7	0.4	28.0	-0.5	25.5	-0.6	21.8	-0.9	0.1	0.6	0.4
JUL 99	29.6	0.4	27.8	-0.7	24.8	-0.4	20.9	-0.7	0.5	1.0	0.1
AUG 99	29.5	0.4	27.8	-0.6	24.0	-0.6	20.0	-0.6	0.0	1.3	1.1
SEP 99	29.7	0.5	27.8	-0.5	23.8	-0.8	19.7	-0.6	-0.1	0.2	0.4
OCT 99	29.8	0.5	27.8	-0.6	23.6	-1.0	20.4	-0.3	1.1	1.2	-0.4
NOV 99	29.7	0.5	27.5	-0.9	23.2	-1.4	20.3	-1.2	1.1	1.2	-0.9
DEC 99	29.4	0.5	27.1	-1.1	23.4	-1.5	22.6	0.0	1.5	1.9	-0.9
JAN 00	29.2	0.7	27.0	-1.0	23.8	-1.6	24.0	-0.3	0.4	1.3	0.3
FEB 00	29.0	0.7	26.6	-1.4	25.3	-0.9	25.9	0.2	1.1	2.6	-0.2
MAR 00	29.1	0.7	26.7	-1.4	26.6	-0.3	25.7	-0.2	1.0	1.6	-0.3
APR 00	29.3	0.5	27.4	-0.8	27.3	0.2	25.7	0.6	1.4	0.8	-1.0

第1表　エルニーニョ監視指数

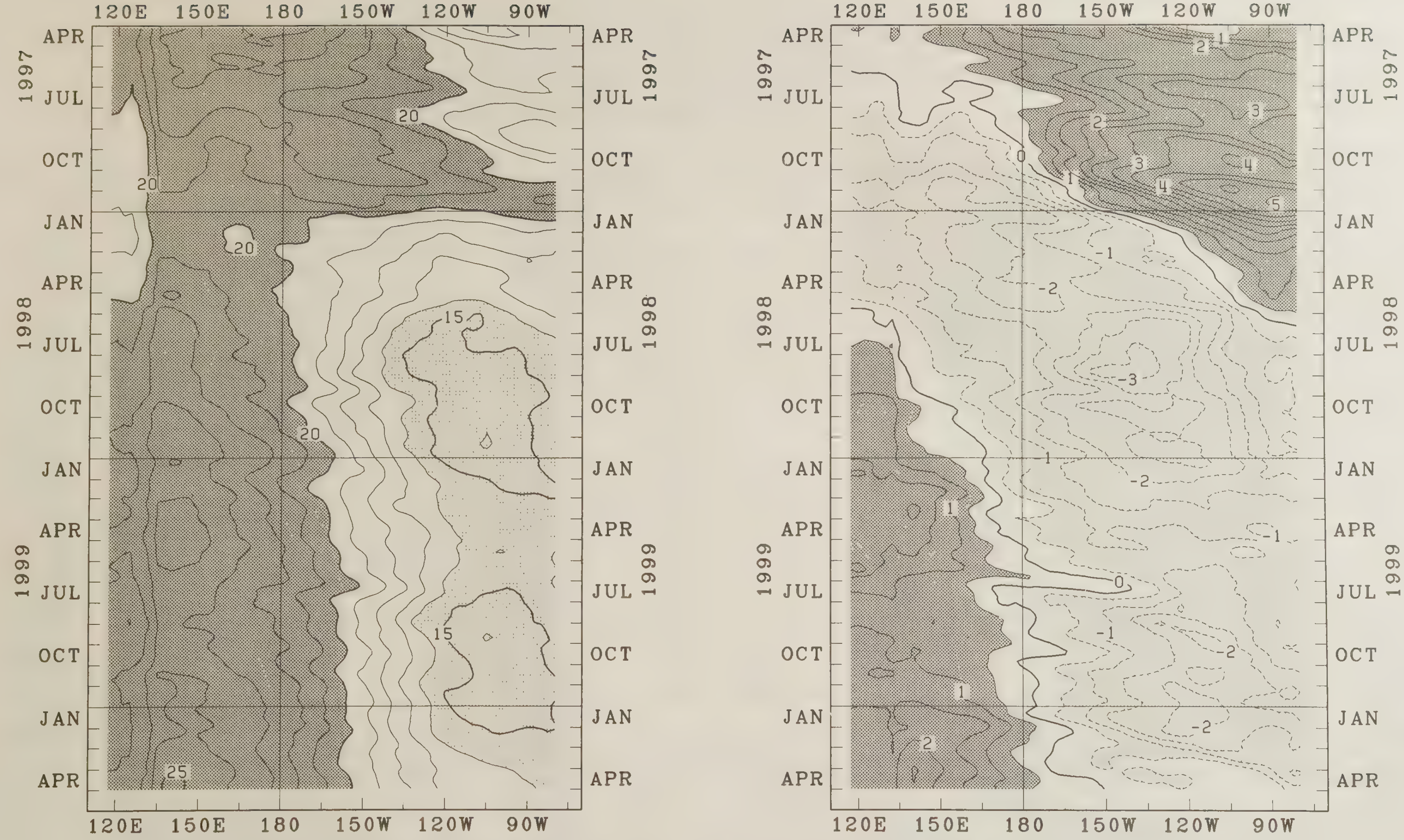
Table 1 El Nino Monitoring indices



第 26 図　赤道に沿った海面水温（左）及び偏差（右）の時間-経度断面図

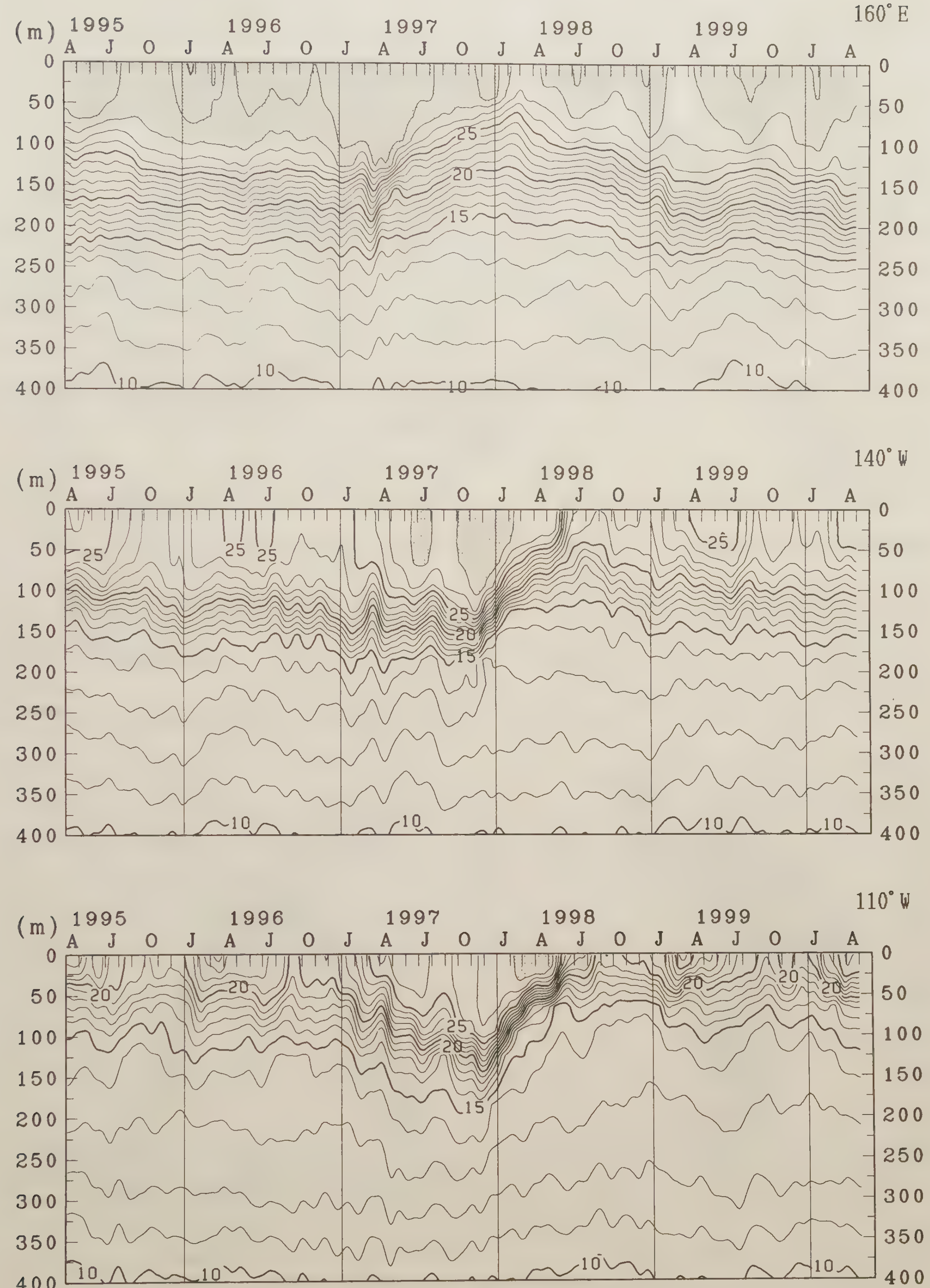
Fig. 26　Time-longitude sections of SSTs (left) and anomalies (right) along the equator (2 °N-2 °S) in the global ocean. Contour interval is 1 °C (left) and 0.5 °C (right). Values greater than 28 °C are shaded and values less than 23 °C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1961-1990 base period means.

Time-Longitude Sections of Ocean Heat Content & Anomalies (Eq.)



第27図　太平洋の赤道に沿う海洋表層の貯熱量（左）及び偏差（右）の時間－経度断面図

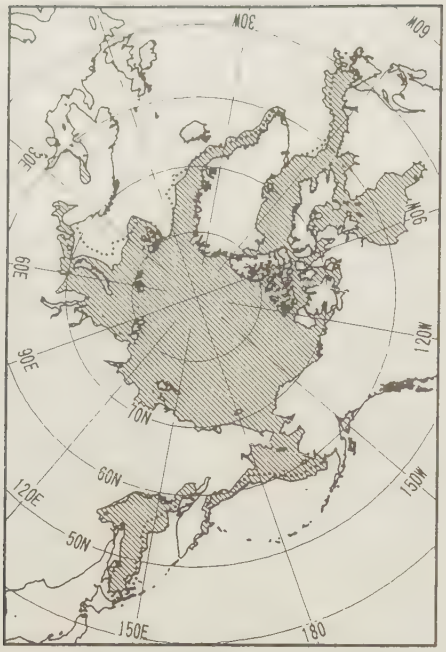
Fig.27 Time-longitude sections of ocean heat content in the upper 260 m along the equator (left) and anomalies (right) in the Pacific Ocean. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (left) and 0.5°C (right). Values greater than 20°C are shaded and values less than 16°C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1987-1999 base period means.



第28図　太平洋赤道域の表層水温の時間－深度断面図

（上：西部、中：中部、下：東部）

Fig.28 Time-depth sections of equatorial subsurface temperature for the western Pacific (top, 160°E), the central Pacific (middle, 140°W) and the eastern Pacific (bottom, 110°W). Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C. Values greater than 28°C are shaded.

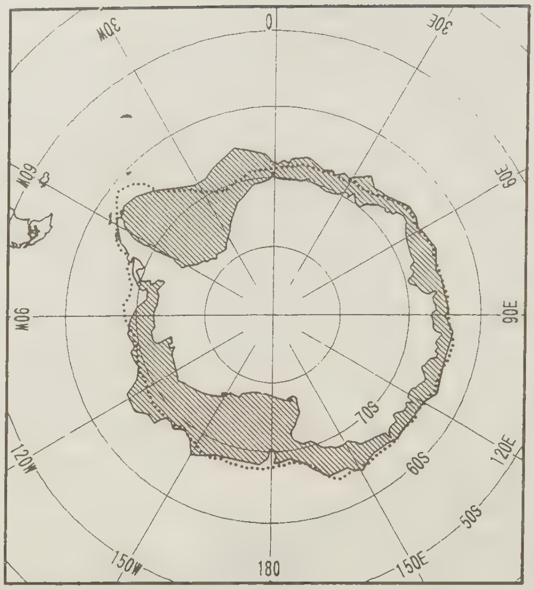


第29-1図　北極域の海氷図（2000年 4月14日）

Fig.29-1 Sea ice chart in the Arctic on 14 Apr. 2000.

The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1972 through 1990.

The data source is the National Ice Center (USA).

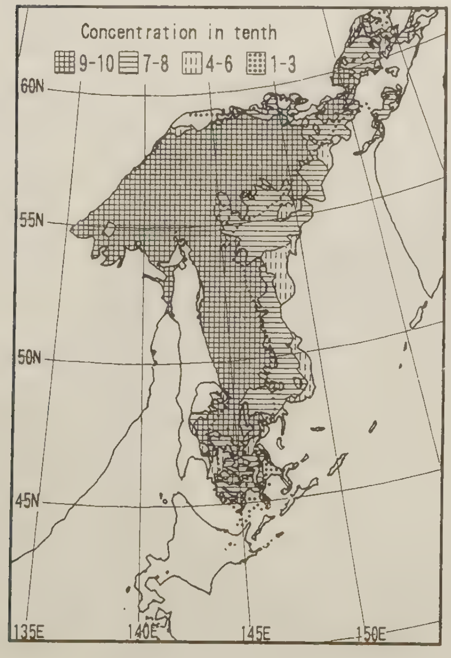


第29-2図　南極域の海氷図（2000年 4月14日）

Fig.29-2 Sea ice chart in the Antarctic on 14 Apr. 2000.

The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1973 through 1990.

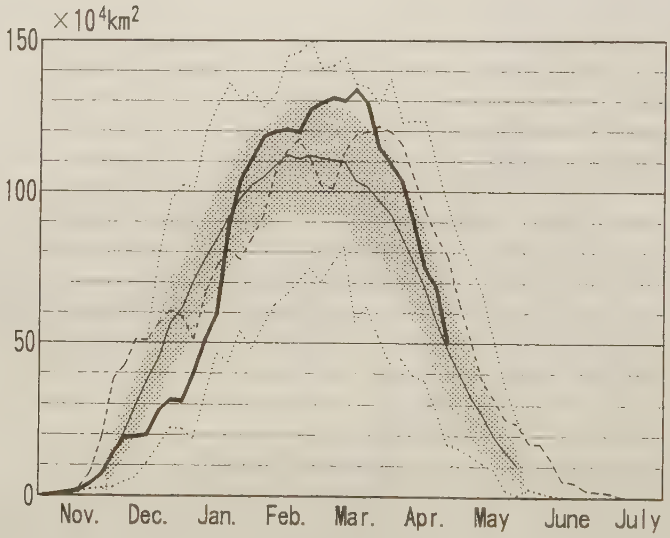
The data source is the National Ice Center (USA).



第29-3図 オホーツク海の海氷図（2000年 4月15日）

Fig.29-3 Sea ice chart in the Sea of Okhotsk on 15 Apr. 2000.

The dotted line denotes the mean ice edge averaged for the period from 1971 through 1995.



第29-4図 オホーツク海の海氷域面積

Fig.29-4 Time-series of 5-day sea ice extent in the Sea of Okhotsk.

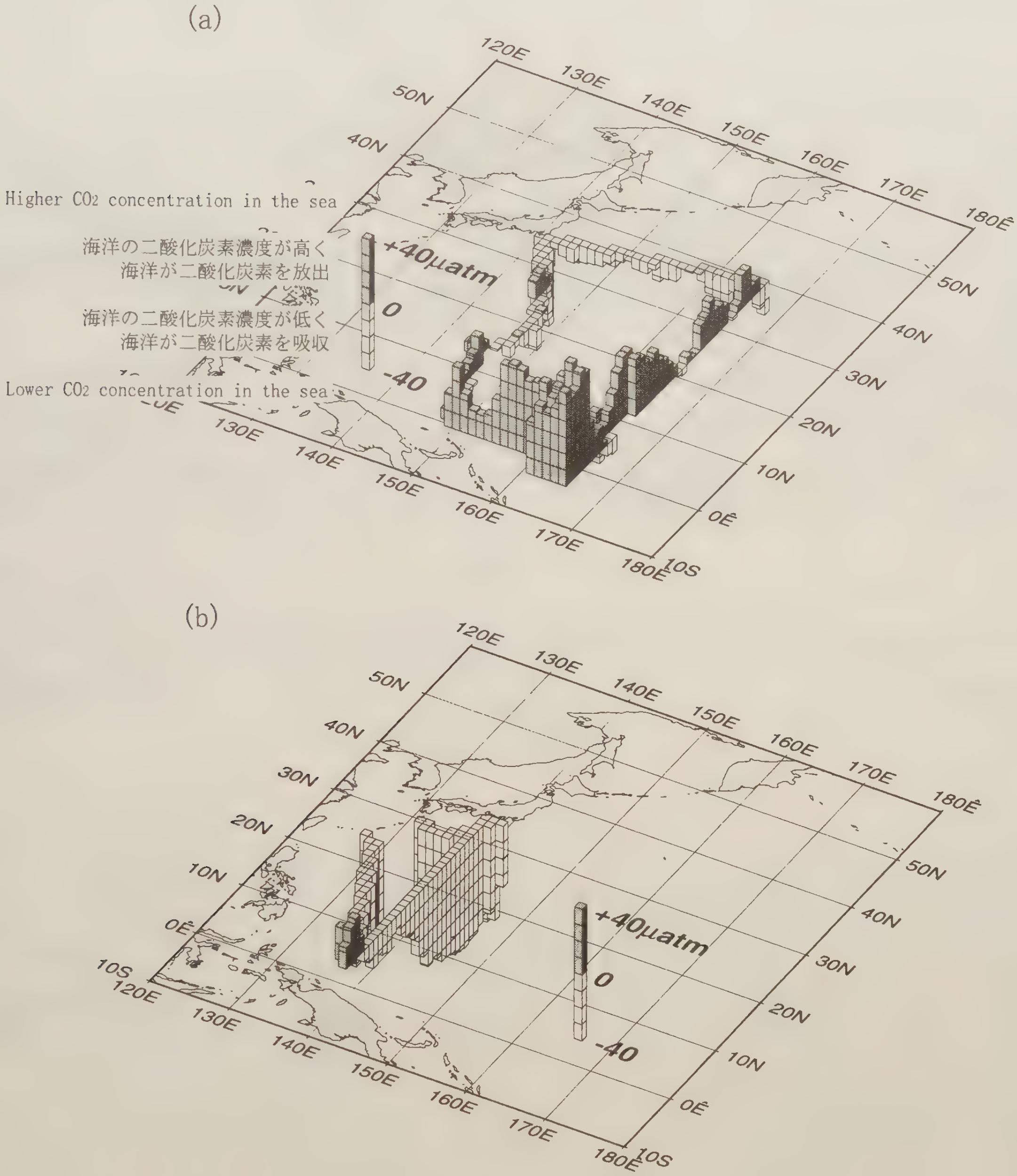
━━━━━ : current season (1999/2000)

――――― : mean extent (1971–1995)

············ : maximum or minimum extent (1971–1999)

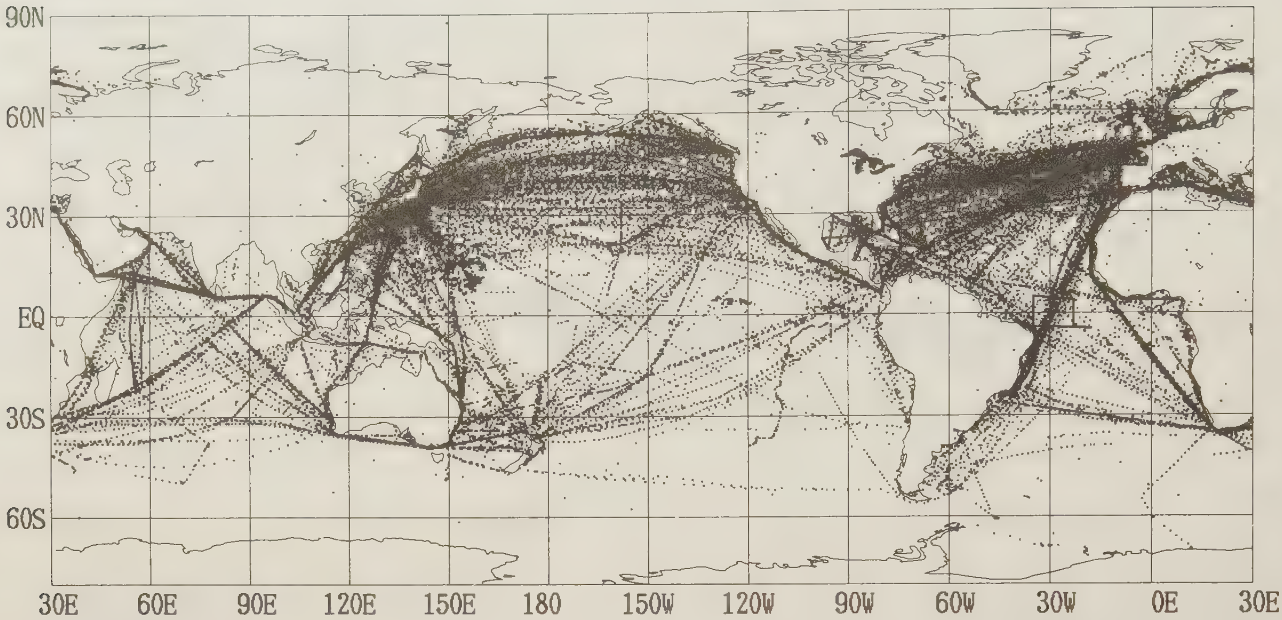
- - - - - - : last season (1998/1999)

(shading) : mean $\pm 1\sigma$ (1971–1995)

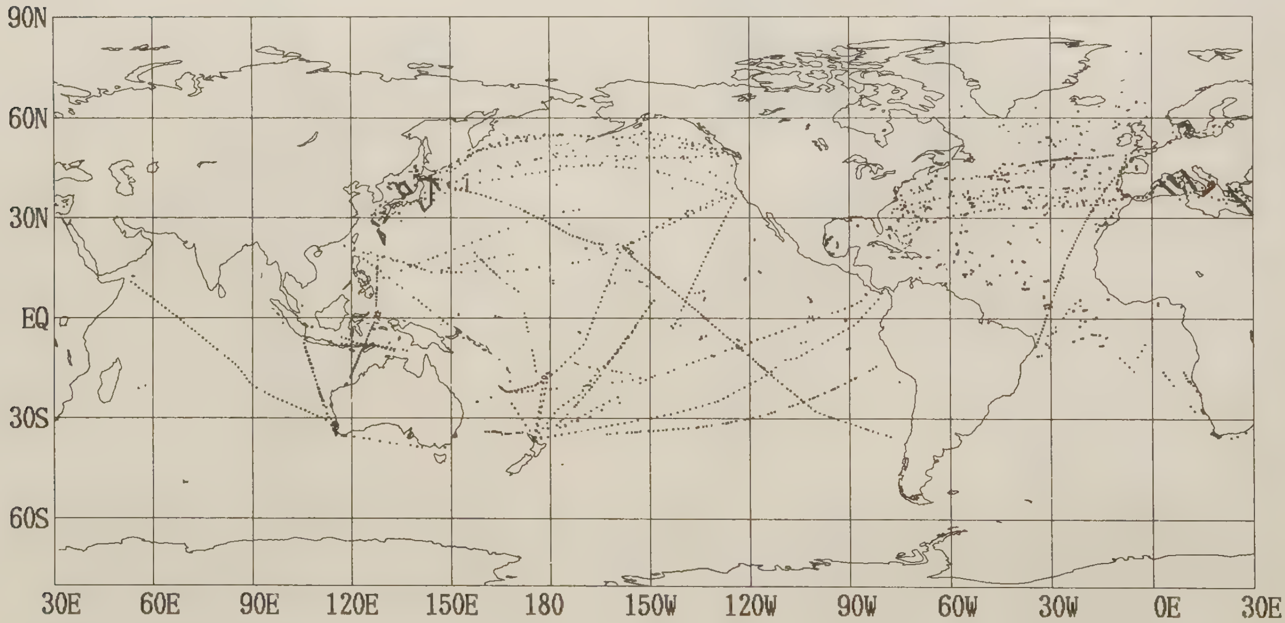


第30図　気象庁の海洋気象観測船「凌風丸」が、(a)1999年9月18日から11月5日にかけて、(b)2000年1月22日から2月19日にかけて北西太平洋で観測した洋上大気中と表面海水中のCO_2の濃度差。棒グラフは、海洋から大気へCO_2を放出する場合を濃い陰影、および海洋が大気のCO_2を吸収する場合を薄い陰影に示してある。

Fig. 30　Difference in the CO_2 concentration between the surface water and the overlying atmosphere in the western North Pacific observed by the R/V Ryofu Maru of JMA, (a) from September 18 to November 5, 1999, (b) from January 22 to February 19, 2000. Darker-shaded upward pillars indicate that the oceanic CO_2 was emitted into the atmosphere, and lighter-shaded downward pillars indicate that the atmospheric CO_2 was absorbed into the ocean, respectively.



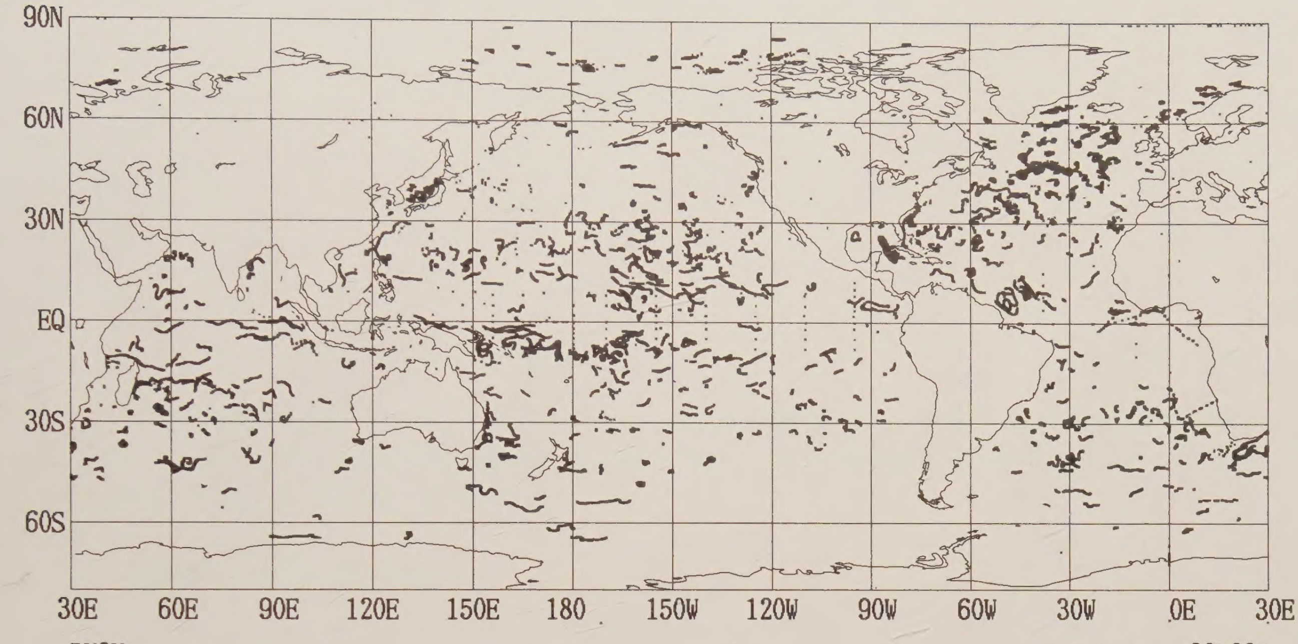
SHIP messages Total data:121757

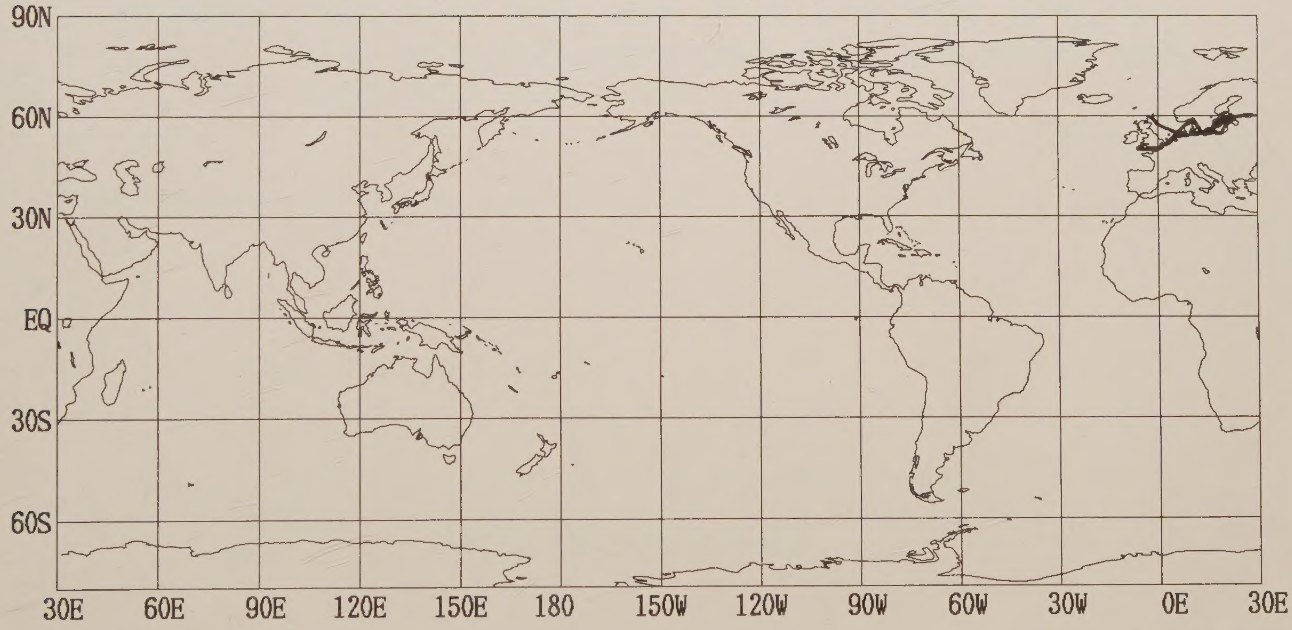


BATHY/TESAC messages Total data: 3379

第31-1図　測点分布図(2000年 4月)

Fig.31-1　Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for APR 2000.





第31-2図　測点分布図(2000年 4月)

Fig.31-2 Geographical distribution of BUOY messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for APR 2000.

気象庁海洋月報

Monthly Ocean Report

April 2000 (No. 88)

本月報掲載の 2000 年 4 月のプロダクトには、気象庁が観測したデータ及び GTS（全球気象通信網）を通じて入手した国際気象通報式による通報のほか、下記の機関等から提供いただいたデータを使用しています。御礼申し上げます。

防衛庁、水産庁、海上保安庁

海洋科学技術センター、（財）日本海洋科学振興財団、（社）漁業情報サービスセンター

北海道大学

水産試験場等（北海道、青森県、岩手県、宮城県、秋田県、山形県、茨城県、東京都、新潟県、石川県、福井県、静岡県、愛知県、三重県、京都府、兵庫県、和歌山県、鳥取県、島根県、山口県、高知県、熊本県）

（順不同）

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